HEALTH OF TOWNS COMMISSION.

REPORT

ON THE

STATE OF THE CITY OF YORK AND OTHER TOWNS.

By JAMES SMITH, Esq., of Deanston,

ONE OF THE COMMISSIONERS APPOINTED BY HER MAJESTY FOR INQUIRING INTO THE STATE OF LARGE TOWNS AND POPULOUS DISTRICTS IN ENGLAND AND WALES.

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CONTENTS.

REPORT *on the* CONDITION *of the* CITY *of* YORK.

By James Smith, Esq., of Deanston.

Houses, 5958; population, 47,779; deaths, 2·4 per cent.; excess in number of deaths in 1841, 160; average age of death, 35 years 9 months; average age of death of adults, 56 years 9 months; proportion of deaths under 5 years to total deaths, 31·3 per cent.

The city of York is situated on the river Ouse, a tidal river. The chief portion of the city is within the ancient walls, which in the olden time were surrounded by a fosse of considerable extent. The older and principal part of the city stands on the eastern side of the Ouse, sloping from the river's edge, with a gentle acclivity, and reaching a summit about 300 yards from the river, and from thence gently declining again into the general flat of the valley. The Foss, a small river coming from the east, and intersecting this division of the city, joins the Ouse by a lock, which has the effect of obstructing the natural flow of the stream, renders the river in a great degree stagnant, and causes the floods to inundate a considerable extent of the site of the city in that quarter. The flow of the stream of the Ouse itself is obstructed by a weir, placed across for navigation purposes, about five miles below the city. The waters of the Ouse overflow a portion of the site, near the margin on both sides, causing great loss, distress, and ill health to the inhabitants of the region. The city seems to have been placed in an extensive marsh, probably for defence in the olden times. The walls still remain of the original height, and so far shelter the city from the winds which blow towards the city over an extensive plain on all sides. But in calm weather they to a certain extent obstruct the ventilation; and it is found that the streets and courts immediately under the walls are the least healthy.

The ancient fosse at the external base of the walls has been for many years filled up, and the soil has been partially underdrained. I perceived, however, that the escape of the water in rainy periods is but slow, and towards the west the ditch has been less perfectly filled and drained, so that water stands over part of the surface at all times, and a mass of rushes indicates the presence of much under-water.

The streets are narrow, in many places curving and irregular, and the lateral streets and lanes are very narrow and ill ventilated. An important improvement was effected some years ago by opening out a roomy market-place in the middle of this division of the city; still there remains a great mass of very confined streets and courts. The chief slaughter-houses are in the very middle of this division, and a more confined and filthy locality I have never seen. There is no means of thorough cleansing the back premises, and the consequence is, a constant

unwholesome atmosphere all around. The division of the city on the western side is far less extensive, with narrow and confined streets, and many very damp and filthy alleys and courts. In the southern corner of this division is the locality where the plague and other pestilences of former ages generally made their first appearance: here also the cholera first appeared in 1832; and at the present day fever is seldom absent. But for a more elaborate and scientific account of all matters relative to the sanatory condition of York in past ages and in the present time, I refer with peculiar satisfaction to the very able Report by Dr. Laycock, given in the Appendix to the First Report. The Report of Dr. Laycock, besides displaying much erudition, science, and industry, furnishes a long series of sanatory statisticts, embracing irresistible proofs of the progress of the sanatory condition of the population of the city, as the drainage of its site, and of the surrounding country proceeded, accompanied by better cleansing, and, I have no doubt, a better system of diet. This Report furnishes, also, from an ancient and aristocratic city, a view of the generally careless and inefficient workings of the public authorities during a long period of time, and shows that on several occasions, when disease became excessive, and the men in power and the better classes in general became alarmed for their own safety, they gave some attention to the undrained and filthy condition of the localities and abodes of the lower classes, and made some temporary efforts to remove the evils; but that no sooner had the impressive period of danger passed over than the drainage and cleansing were neglected as before; that not only were the old places left in their former condition, but even where new dwellings were from time to time constructed, no measures appear to have been taken to erect them on higher and drier sites, or to prevent the recurrence of former evils by systematic drainage and cleansing. The general progress of improvement in the country has induced a rather better structure of houses for the working-classes: they are still, however, defective; and the sewerage and the arrangements for dungsteads and privies are pretty much in the same state they seem to have been in 100 years ago.

York has not for many years been much extended—at all events in no ratio to the extension of most of the manufacturing towns; yet its slow increase does not seem in any degree to have led or enabled the authorities to give attention to the improvement of the condition of the streets, courts, and dwellings of the poorer classes. From the statements in the Report of Dr. Laycock (which is the Report assented to by the best-informed local officers), as well as from my own observations when I perambulated the city, and inquired into the sate of the sewerage, it appears that the general main sewerage is imperfect; and as to court and house drainage, there is none except in connexion with some of the houses of the better classes.

The aspect of York, as seen in the principal streets, is tidy and pleasing, and the streets, though narrow, are well kept; not so, however, the more retired and densely crowded parts, which have the same damp and filthy character as in all the other towns.

The supply of water is defective in quantity and in quality. The supply is not constantly on; branches are not carried into every dwelling; and the water being pumped directly from the river, is, in periods of flood, very brown and muddy, with an earthy taste; nor is the altitudinal

pressure sufficient for extinguishing fires in the higher houses, or for cleansing purposes.

The smoke nuisance is not very great at York, though some steam-engines erected of late years on the west bank of the river have been complained of. None of the furnaces, so far as I could learn, have arrangements for consuming the smoke, and the chimneys are lower in height than steam-engine chimneys generally are in other towns, whereby the smoke is thrown more upon the houses in their immediate neighbourhood.

There is a nuisance of considerable extent arising from large depôts of dung, chiefly on the margin of the Fosse. These dung-heaps belong to "muck-merchants," who there mix the various qualities of matter collected; and which are permitted to ferment, in order to improve their appearance for sale. All around those heaps are pools of stagnant filthy water, and a most noxious effluvium is constantly emanating from an extensive surface.

The extensive vale in which York is situated is generally of an alluvial clay subsoil, the thorough under-draining of which has as yet made but little progress. The original swampy character has in a great measure been removed by the surface-drainage usually accompanying cultivation; but that complete and uniform dryness of the soil which follows thorough draining properly executed does not at present exist to any extent. Much of the land is flooded in periods of heavy rain, and misty vapours are seen hanging over the fields after much rain. Independent of the mischief to health caused by an atmosphere loaded with damp, there is a great amount of heat carried off from undrained land by the invisible evaporation which is constantly going on, and the heat of the sun is absorbed for hours and days by the evaporation of the water retained on a portion of the surface. The extent of open ditches necessary for the ordinary surface-drainage retains a large amount of stagnant water, which more or less loads the atmosphere with vapour, frequently of a miasmatic character, whereby diseases of various types are engendered and promoted. In some of the flat clay districts of Scotland, fever, agues, and rheumatism prevailed much before the introduction of thorough-draining, where open ditches and surface furrows were rife; but since thorough under-drainage has been introduced, and the ditches or main levels have been laid with conduits, and covered over, the inhabitants of those regions are full as healthy as those on the dry mountain-side. In the former condition of the drainage, these regions were in the autumnal months often covered for some hours with a dense fog, whereas, in their present condition, fog is never seen there when it does not generally prevail in other places. The profits to be derived by agriculturists from thorough drainage will induce in due time its universal adoption; and there is no estimating the extent of the beneficial effects it will produce in the improvement of the general climate of the country, the effects of which will be equally felt in large towns and populous districts, if not counteracted by imperfect drainage and sewerage, and by a filthy condition of the immediate locality of the towns themselves.

REPORT *on the* CONDITION *of the* TOWN *of* KINGSTON-UPON-HULL.

By James Smith, Esq., of Deanston.

Houses, 8136; population, 41,130; excess in number of deaths in 1841, 449; average age of all who died, 28 years; of adults, 52 years 5 months; proportion of deaths under 5 years to total deaths, 42·8 per cent.

The town of Hull is situated at the confluence of the rivers Hull and Humber in the East Riding of Yorkshire. The site is upon a nearly flat surface of ground, a similar feature of surface extending for a distance of at least 10 miles to the eastward and north. The soil and subsoil are of a strong alluvial clay of considerable depth, resting upon the chalk formation. The general surface is about six feet above high water-mark of spring tides, the spring tides rising from low water to a height of about 18 feet.

The river Humber stretches along the west-by-south side of the town, and the distance across to the opposite flat land of Lincolnshire is above a mile. The Hull is a small river, coming from the flat country to the eastward, and approaches the Humber towards its junction, nearly at a right angle, passing through the southern section of the town. The Humber falls into the open sea of the German Ocean about 16 miles to the eastward. The town is unsheltered from the winds on all sides. Hull is a seaport of considerable antiquity, and there are extensive docks in the interior of the town from which there is a lockage into the Humber. As in most old towns, the streets are somewhat irregular, crooked, and narrow. The houses in the principal streets are high, having in general from four to five flats. Many narrow alleys cross from one street to another through the blocks of building, and those generally enter from the streets through closely-covered ways. Many of these alleys lead to and in some cases through small courts in which better classes of people reside, such as the families of the masters of the smaller vessels, and the mates of the larger; and it is remarkable that in those courts enclosed on all sides by large blocks of tall houses, and accessible only by long, narrow, and in most cases filthy alleys, yet, having a well-flagged surface, and being kept very clean by scrubbing and washing, the inhabitants are in general remarkably healthy and fresh looking. It is very pleasing, after having passed through a long, narrow and filthy passage to find yourself all at once in a court of from 20 to 40 feet square, or oblong, with a paved area washed as clean as the deck of a ship. The doors and windows of the dwellings are all as tidy as possible, and the windows have all clean muslin screens. In these localities the people are intelligent, cheerful, and civil.

The principal streets have covered sewers of considerable dimensions under the middle of the way, which discharge into the Humber and the Hull. The tidal water flowing into the sewers causes considerable obstruction to the free flow of the sewer water, promoting deposits of the *grosser matter* held in suspension; but it has been arranged that

water can be made to flow into some of the sewers from the docks with considerable force at low water, and, this being regularly applied at intervals, those sewers are kept in good condition.

The surface and sewerage water is in general conducted towards the sewers in open channels, and these channels in most cases have a tardily flowing stream of dirty water and filth exhaling most offensive and noxious gases. During high-water of spring tides the water pervades the whole of the sewers and drives the foul air from the area of the sewers into the atmosphere of the streets through the open gully-holes which are placed at intervals to admit the water from the surface. These constant communications from the sewers to the surface of the streets, permitting a stream of unwholesome emanations from the putrid matter in the sewers to flow into the atmosphere, which, mixing with the air breathed by the inhabitants, greatly deteriorates their general health.

The surfaces of the principal streets are paved with whinstone or granite blocks and with boulders, and are tolerably smooth and even, but still there are inequalities and hollows from neglect of the sunken and worn stones which hold pools of water in wet weather. The foot-ways are mostly flagged, and are tolerably smooth. In many of the streets, however, there are no foot-ways, and the open channels of the streets run along by the walls of the houses. Many of the old cross streets are without sewers or under-drainage of any kind, the filthy water flowing or being too often stagnant in open channels. In many of the more recently-formed streets there is neither sewerage, paving, nor macadamizing of any sort; the whole surface is broken and rough, retaining the water that falls from the clouds, which becomes putrid, and the nuisance is in many cases greatly aggravated by the slop-water and filth thrown from the doors and windows of the houses.

There are many vacant spaces of ground remaining to be built upon, which are left in a totally neglected state. The surface is in general low, and full of hollows retaining water; and all sorts of rubbish and filth are from time to time thrown down promiscuously, without any regard to evenness of surface; nor are any of these spaces under-drained, so that, from the tenacious nature of the soil, every drop of water is retained upon the surface. The greatest nuisance to which Hull is subject is that arising from a great extent of open ditches which surround the town and cross through several sections of it, receiving the sewage water from many localities, and containing at all times a mass of filth, decomposing and emitting bad smells and noxious gases. These ditches have hitherto been perpetuated in a great measure from the circumstance of the division of the site of the town into different districts, and these being under different authorities as regards the drainage and sewerage, one of the authorities refusing, to all the others, liberty to carry these channels for sewage through their territory, although it is in the best direction for fall. Typhus fever and, in some cases, ague are more frequent in dwellings near the margin of those open sewers than anywhere else in the town. The drainage of the agricultural country on the north and east of Hull is but indifferent. The great levels for carrying off the collected surface-water are by no means well arranged, and they are kept in very bad condition. The thorough

drainage of the general surface for agricultural purposes has been as yet but very partially accomplished, and the consequence is that there is a very extensive exhalation during wet periods, and for some time after, which must be more or less hurtful to health. Such drainage is not of course immediately under the control of the town authorities, but they might use their influence in inducing the owners and occupiers to drain. The great benefits and profits, however, to be derived from thorough draining for agricultural purposes, are now becoming so generally known and appreciated that the parties for their own interest will most likely within a few years have the whole drained.

Another very marked and extensive nuisance in the town of Hull arises from the accumulation of the dung and filth taken from the dwellings in the town which is mixed and assorted, and laid up in depôts within the precincts of the town. The dung thus laid up often remains there for some time in the hands of the *muck-merchants* before being sent off to the farmers. Hull is known to be remarkable for having the greater part of the refuse and filth of the town carried off from the dwellings regularly, with the exception of that which is kept in private yards, each privy and ash-bin being cleaned every second day at furthest, and all except private ones twice a-week. Upwards of 400 people, including assistants, make their living by gathering muck from privies and ash-bins. Each muck-gatherer has an assistant, and in some instances a couple of boys: they go with a cart drawn by a small horse or donkey. The cart proceeds along the street stopping at the entrances to alleys and courts, the dung-gatherer with his assistants having a basket or bucket into which they put the ashes, vegetables, and other refuse, and the night-soil which they take from small ash-bins, most commonly situated under a privy-seat, so that the urine and the moisture of the night-soil are absorbed by the ashes, and the whole becomes a mass of good consistency, the moisture preventing the ashes from blowing away, whilst the ashes prevent the moisture from running. These bins in general have a bottom of flag or smooth firm earth, so that with a broad shovel the whole of the matter is easily cleaned up: the bucket is then carried to the cart and emptied into it, and another filling is gone for. The time during which the muck-gatherers are permitted to work is from five in the morning till eight; and during that time they carry, on an average, 230 buckets, 150 filling a cart, making 10 cwt. of muck. This each carries to his private yard, generally situated in the outskirts of the town, though sometimes in the interior. There the muck-gatherer assorts and mixes the dung to suit his customers, and disposes of it as soon as he can to some farmer or to some large muck-merchant or agent, who ships it for Lincolnshire or for some other farming district to which it can be water-borne. The price got for the prepared dung is about 3*s*. per ton, which affords the gatherer about 14*s*. per week, after paying for his assistants and horse. Taking the wages of the muck-gatherers with the wages of the assistants, and the cost of carting, &c. at 12*s*. per week for 400, there will appear a weekly cost of 240*l*., being annually 12,480*l*. In some cases, by agreement with the householders the soil is permitted to remain for two or three weeks. A very low grade of muck-gatherers called "snatchers" go about during the night or

at very early hours and carry off occasionally such as has been left over. Thus a corrective is kept up to push the regular muck-gatherers to do their duty.

The general taking away of the ashes, privy-matter, and house-refuse frequently diminishes in a considerable degree the amount of filth and decaying matter usually found in every corner of large towns; still in many parts of Hull are to be found some very filthy courts and alleys.

Most of the slaughtering-houses are in the midst of the town, in a long narrow alley passing from the main street to a parallel street at a considerable distance. Those slaughtering-places are very confined, and generally have a muck-yard attached, which is filled with the offal, dung, and blood, taken from the animals, and most offensive effluvia are constantly flowing from the putrifying masses; the bloody matter, moreover, flows in streams along the open channels towards the covered sewers in the streets. Cows and pigs are kept in many places.

The scavenging of the streets is under the superintendence of the Surveyor to the Myton Commissioners, and the Surveyor to the Sculcoats Commissioners, and is upon the whole done well to the usual extent in such towns, but is far from reaching that state of cleanliness which is attainable and which is essential for the health and comfort of the inhabitants.

The police force in Hull is in a very efficient state; but they have no power to enforce the removal of many of the nuisances, and there is, in consequence, no thorough supervision of such matters by the police.

Most of the houses occupied by the lower classes in Hull are of the same description as those similarly occupied in all old towns, namely, the houses not occupied by a higher class in former times, with some modern erections built in some vacant spaces previously occupied. In the arrangement of these, little attention has been paid to the health and comfort of the inhabitants. There are no cellar dwellings in Hull, the rise of the tide so near to the level of the general surface of the streets preventing their adoption.

A better class of cottages have of late been erected in some places in which more attention has been paid to the important points. The most recent and most improved are let off in oblong courts open at one end to the street and generally closed at the other by a wall, and in some cases a dwelling. These courts are from 18 to 20 feet wide, well flagged on the surface with a fall towards the centre, where there is a covered sewer to receive all the surface and slop-water through openings grated over, or covered with a stone perforated with many small holes. A row of stand-pipes for supplying water is arranged along the middle of the court. No carts are permitted to come into these courts. The dwellings are arranged on each side, have a living-room below of from 14 to 15 feet square, with a little scullery in one corner at the back, and a very small back court in which there is a privy fitted to receive the ashes, &c., which are removed daily by the muck-gatherers: up-stairs are two small bed-rooms. Those houses are occupied by artisans and the better class of labourers. The buildings are of brick with slated roofs: the floors of the living-rooms are flagged, and there are no under-cellars. Some houses of the better class lately built have close sewers from each dwelling communicating

with a main sewer, but still having to discharge the water from the main sewer into one of the open ditches formerly mentioned. There is a lack of fall, and the filth is accumulating fast in the sewers without any means of clearing it out by water. The sewers will have to be opened, and the mud must be taken out with buckets at great expense, and with much annoyance to the neighbourhood during the operation. I was informed by medical men, that fever frequently followed in the neighbourhood the opening of such sewers.

The prison situated in Sculcoats was most unhealthy until a proper sewerage was introduced, and trapped water-closets were adopted: now fevers are of rare occurrence.

The schools, of which there are several, seemed very well conducted, and are generally ventilated to a considerable extent, though not so completely as is desirable; at one poor-house school in the parish of Sculcoats, I found the rooms low and ill ventilated, the play-courts for the children undrained and full of water, and the privies in a very filthy state; and I learned that the boys were obliged to clean them out occasionally. There was evidently a great want of supervision.

The supply of water is deficient; but an Act has just been obtained for procuring a greater supply: much contention has existed between two parties in the attaining of the Act, the one contending for having the water from one source and the other from another. It is now believed by persons competent to judge that the source whence the water is being procured will afford water of a good quality, and there will be no difficulty in carrying the water into every house, and in keeping a constant supply at high pressure.

The evils arising from want of powers and from the want of a full and steady exercise of the existing powers, are obvious in Hull, as in other places; and the multiplication of surveyors and other officers causes trouble in carrying on the ordinary business, as well as in preventing improvements; and the expense is high, whilst the service is inefficient.

Connected with Hull there is an instance of the practicability and of the advantages of consolidating the collection of rates, as given in the evidence of Mr. Fox, printed in the First Report.

There are public subscription-baths in Hull, which are much frequented by the middle classes; and also, on Saturdays and Sundays, to a considerable extent by the lower classes.

Large cotton works were erected in Hull some years ago, which give employment to a portion of the young population, and especially to females of all ages. The works seemed well regulated, and are heated and ventilated in the usual manner followed in cotton factories, but by no means so complete in this respect as is desirable.

A few rows of cottages have been built at a little distance for the accommodation of a portion of the people. These cottages are not very well arranged, and are very untidily kept with the exception of a few dwellings. The ash-pits and privies are too much intermixed with the dwellings. The situation low, and damp, and badly drained.

Hull, upon the whole, as a seaport town, is respectable as to cleanliness, yet far from the desirable standard.

REPORT *on the* CONDITION *of the* TOWN *of* HUDDERSFIELD.

By James Smith, Esq., of Deanston.

Houses, 4873; population, 24,000; excess in number of deaths in 1841, 266; average age of all who died, 27 years 3 months; average age of adults who died, 52 years 5 months; proportion of infant deaths under 5 years to total deaths, 40·3 per cent.

The town of Huddersfield, in the West Riding of Yorkshire, is situated on a bank of land, rising from the valley of the river Colne: only a small portion of the town reaches so low as the river. The middle of the town is about 150 feet above the level of the river; the upper part about 200 feet. The aspect is towards the south and west. The surrounding country consists of valleys and rising grounds; and on the east and north-east, the surface rises rapidly to a considerable altitude above the town. The rocky formation is chiefly gritstone and freestone, of the coal formation, covered, in some places, to a considerable depth, with a bed of tenacious clay; so that, so far as regards the drainage of the general surface, it may be considered impervious. The surface of the surrounding country is in an undrained condition, at all events not thoroughly drained, and therefore may be considered to retain upon the surface much of the water falling in the shape of rain, thereby causing chilling exhalations and fogs: nevertheless, from the sloping nature of the surface, the bulk of the water flows rapidly off, whilst the prevailing and most salubrious winds are freely admitted, and thereby, so far, the situation of the town is favourable to a healthy condition of the inhabitants.

This town is peculiarly situated, as regards some parts of its local government. The whole of the land on which the town stands belonged to the late Sir John Ramsden, and now belongs to his son, a minor; under the guardianship of trustees appointed by his father, the whole power of arranging the streets of the town is retained for the proprietor. The late Sir John Ramsden did much for the ample width and proper arrangement of the streets; and, upon the whole, they are well arranged, of ample width, well paved, or macadamized. The main sewerage has been attended to. At the time of the cholera, the trustees agreed with the inhabitants that a sewer should be provided in every street; but owing to some misunderstanding betwixt the parties and the Board of Surveyors, the plan was not carried out.

The greater part of the town is of recent origin, and almost the whole of the houses have been erected on the sufferance of the lord of the manor, and without any agreement or lease, the parties building relying upon the honour of the family of the superior. In a few instances, proprietors of house property have had their premises taken possession of by Sir John Ramsden, for purposes of local improvement; but, in every case, a fair equivalent has been paid. Such want of tenure facilitates the progress of improvement, when under the careof a wise, enter-

prising, and honourable proprietor, but is liable to many objections, and could not be maintained in large communities. The management of the affairs of the community of Huddersfield is committed to a Board of Guardians and a Board of Surveyors, elected by the rate-payers.

There are in Huddersfield many unpaved streets, many without sewers, and a considerable extent of damp and filth in the streets, courts, and alleys; and, in such localities, fevers, and a lower tone of general health prevail.

The private courts are considered to be beyond the jurisdiction of the authorities, and the cognizance of the police; and, although in many places crowded with pigsties, filthy and extensive dunghills, and open privies, they are permitted to remain a nuisance to the neighbourhood, and excessively injurious to the health and comfort of the inhabitants themselves; and, although each individual complains of the nuisance caused by his neighbour, he refuses to remove the nuisance caused by himself. Efforts are now making by the Board of Surveyors to extend the sewerage, and what is going forward is well executed, structurally; but, from the want of sufficient fall in some of the cross streets, there will be a tendency to sludge up with mud; and no means are provided for directing, from time to time, a sufficient current of water through the sewers to clear them out. The sewers are here deeply laid, and are cut partly in the rock, partly in stiff clay. The depth has had great effect in laying dry some low-set houses and cellar-dwellings, at a considerable distance from the drains, which were formerly either damp or subject to flowings of water over their floors. This shows the great efficiency of deep under-draining in rendering dry the sites of houses.

The streets and roads of Huddersfield that are fully formed are paved with gritstone blocks, and in many placesare macadamized; and the streets, especially the paved streets, are well kept on the surface, as to smoothness and cleansing. A system of washing would suit well on the streets of Huddersfield, from their smoothness, and from having a considerable declivity.

Some experiments were made by attaching a hose-pipe to one of the service pipes at a fire plug, and jetting it upon the street, and over the front of a building, (the George Inn): the front of the inn was well cleansed from top to bottom, in about 15 minutes, and the streets and pavement, to a considerable extent, were well cleansed in an equal period of time. The expenditure of water was not ascertained, but from experiments made elsewhere, as to the quantities discharged in a given time, and with a given pressure, through a nozzle of an equal diameter, it was estimated that 80 gallons were discharged per minute, or 1200 gallons each quarter of an hour. 1200 gallons would cost about 4*d.*, and allow 2*d.* for labour; the cost of washing the front would be 6*d.* Taking again 1000 yards of streets cleansed from one point in 15 minutes, the cost would be 6*d.*, that is including establishment charges and everything. Under ordinary circumstances, a common scavenger will sweep over 1000 yards per day, at a wage of 1*s.* 6*d.* Taking into view the more thorough cleansing by water, it will be seen that streets regularly cleansed by water would not be more dirty at the period for cleansing than streets being swept are at the moment each

sweeping has been just completed. The thorough cleansing effected by water would diminish in an immense degree the continued exhalations of damp from the surface of the streets, after a period of rain, and would cause a great saving to the inhabitants, by the diminution of the quantity of mud carried into their dwellings by the feet of persons going in from the streets. In dry periods, the quantity of flying dust would be greatly diminished, and the expense of the ordinary watering of streets would be wholly saved.

At the Huddersfield Infirmary, I found a marked instance of the influence of bad sewerage in promoting fevers. A new house had been built some years ago for the infirmary: every pains were taken in the structure to provide for ventilation; but the drainage was executed much on the usual plan: sewers were carried under the passages of the low flat, to receive the water from the water-closets, from the scullery, and from the baths, and the slop-closets of the upper floors. A drain was carried from the building at the back, towards the front, passing round one end of the building, and going along a lawn in front, to a sewer in a street about 60 to 70 yards distant. The structure of the drain was of the usual style of dry stone building for drains, without cement, and of course pervious to water and air. The sewer water was thereby permitted to pervade, to some extent, the adjoining soil, and the gas generated by the decaying matter in the drain, passed through the soil into the atmosphere, so that bad smells were continually felt in the house, and in the open air, all along the line of the drain; and fever was seldom absent from the house. After some time, it occurred to the medical attendant that the effluvia from the drain must be the cause of the continued fever, and of a difficulty found in the cure of surgical cases. There being some old coal workings under the site of the building, it was suggested to make an opening into the workings, and to discharge the sewer water into them. This was accomplished, the bad smells were no more felt, and the fever ceased to prevail, whilst surgical cases proceeded generally in a satisfactory manner.

REPORT *on the* CONDITION *of the* TOWN *of* LEEDS.

By James Smith, Esq., of Deanston.

Houses, 33,902; population, 168,000; deaths, 2·7 per cent.; excees in number of deaths in 1841, 1169; average age of all who died, 23 years 4 months; of adults, 51 years 1 month; proportion of infant deaths under 5 years to total deaths, 46·9 per cent.

The town of Leeds is situated on the right and left banks of the river Aire, a navigable river in the West Riding of Yorkshire. The town lies chiefly on a slope of considerable acclivity, running towards the south-east from the margin of the river. The substrata of the site of this part of the town are of the coal measures, and the surface covering is a tenacious clay of several feet in depth, the rock coming near the surface in some places. The general character of the subsoil is retentive. On the opposite side of the river, stretching towards the west, there is an

extensive flat, on which a considerable extent of buildings has in late times been erected, and the chief extension of the town is now taking place in that direction. Here are the Holbeck and Hunslet districts. This flat is traversed by two brooks (the Holbeck and Hunslet), which form the natural main sewers of the district: in these the flow of water is, however, retarded by various artificial obstructions which cause frequent overflowings of the ground, and at all times retain masses of putrescent matter in the channels of the brooks. The natural flow of the river Aire is obstructed by weirs placed across for navigation and mill purposes; the consequence of which is, that the water of the river is kept very much in still pools, and the lower streets, and houses on the margin are flooded occasionally. Some water-courses for mill purposes, called "the Calls" pass along a considerable distance near the margin of the river, causing floodings and damp. The obstructions in the river have also the effect of overflowing the outlets of the Holbeck and Hunslet brooks, and consequently the whole natural drainage, and the sewerage flowing into these brooks, is obstructed. In some places the banks of those brooks have been raised above the level of the adjoining general surface, causing damp and preventing a proper sewerage. In a district so flat and extensive as this, there are no means of obtaining a perfect drainage and sewerage without a main level brought from a lower point of the river.

The general arrangement of the streets and alleys of Leeds is in the older parts very much as in all old towns, somewhat irregular and narrow; but, fortunately for Leeds, the main street is of ample width, arising, as I was told, from a practice of the olden time, of having gardens in front of the houses, the area of which has in later times been added to the street. The streets running parallel to the river are, however, narrow, crooked, and irregular. Streets more recently formed are more ample in width, and there are many very cheerful open streets where the better classes reside. The lower classes here, as elsewhere, inhabit the less comfortable and less healthy localities along both sides of the Addle Beck, a stream which intersects the eastern division of the town, and which is obstructed by many weirs and bridges of limited openings, and by the encroachment of buildings on its bed. A great number of dye-houses and other manufactories are erected on the margin, and interspersed with these are a number of dwellings which, from the damp and the pestilential effluvia arising from the decaying matter in the bottom of the Beck, combined with the smoke and fumes arising from the various works, are most unhealthy. But by far the most unhealthy localities of Leeds are close squares of houses, or yards, as they are called, which have been erected for the accommodation of working people. Some of those, though situated in comparatively high ground, are airless from the enclosed structure, and being wholly unprovided with any form of under-drainage, or convenience, or arrangements for cleansing, are one mass of damp and filth. In some instances I found cellars, or under-rooms, with from two to six inches of water standing over the floors, and putrid from its stagnation in one case, from receiving the soakage of the slop-water standing in pools in the street adjoining. The ashes, garbage, and filth of all kinds are thrown from the doors and windows of the houses upon the surface of

the streets and courts; and in some cases, where a gallery of entrance has been erected for the inhabitants of the second floor, the whole of the slops and filth are thrown over the gallery in front of the houses beneath; and as the ground is often sloping towards the doors of the lower dwellings, they are inundated with water and filth, and the poor inhabitants are placed in a miserable and unhealthy condition. The privies, as usual in such situations, are few in proportion to the number of inhabitants. They are open to view both in front and rear, are invariably in a filthy condition, and often remain without the removal of any portion of the filth for six months. The feelings of the people are blunted to all seeming decency; and from the constantly contaminated state of the atmosphere, a vast amount of ill health prevails, leading to listlessness, and inducing a desire for spirits and opiates; the combined influence of the whole condition causing much loss of time, increasing poverty, and terminating the existence of many in premature death. Mr. Baker, a medical practitioner of Leeds, and for many years one of the council, published a few years ago a treatise on the Vital Statistics of Leeds, going very fully into this subject, and he has demonstrated very clearly and undeniably, from facts observed during a long residence, the evil effects of bad ventilation, bad drainage, and deficient supplies of water.

Many of the streets, alleys, and courts are unpaved, and some paved in a very imperfect manner. They are full of ruts and hollows holding water and filth. All vacant spaces of building-ground are left undrained and unenclosed, and with uneven surfaces; and in many cases the slop-water from the neighbouring dwellings drains into them, creating extensive ponds of filthy water. All sorts of rubbish and filth are thrown upon these vacant spaces, and they become a wide field of deleterious emanations. Pigsties are frequently erected upon them, and they are used as depôts for dung by the muck-gatherers. No cognizance is taken of their condition by the police.

In the Holbeck and Hunslet districts the streets have been laid off without reference to the best lines for drainage, and no systematic plan of drainage has been arranged. The river and the brooks overflow many portions of this district in rainy periods; and even in dry seasons the drainage is so imperfect as to leave stagnant pools of water in many of the streets and courts; and the houses having in general been set down without reference to any fixed levels, the lower floors of many are as far under the surface of the ground as to be continually damp. The greater number of the streets are unpaved, and consequently of uneven surface, full of ruts and hollows holding water; and as from the want of proper sewerage there are no house-drains, the slops and refuse from the houses are thrown upon the surface of the streets, which are in many places thereby raised some feet above the original level. All over this district the dunghills, ash-pits, and privies have been set down without any order, in some places encroaching upon the streets; and in the courts, the filth often covering almost the whole area.

The slaughter-houses at Leeds, as elsewhere, are a source of nuisance. There is a want of drainage, want of water, and want of efficient regulations for cleansing.

The main sewerage of the town is imperfect. There are sewers in a few of the principal streets, but in the greater number of streets and alleys there is no provision whatever for drainage or sewerage. The main

sewers are defective in position and defective in structure; they discharge either into the river or into the Addle Beck. The water is often set back into the sewers by floods; and the gross matter in the water, sinking and sludging by the sides of the river, forms sources of much annoyance, and contaminates the atmosphere. Immediately after the passing of the late Improvement Act for Leeds, steps were taken by the Mayor and Council for having a general survey made relative to the sewerage, which was ably executed by Captain Vetch of the Royal Engineers; and a plan was furnished by him of a superior character, providing for the complete sewerage of all the streets, alleys, and courts, and carrying the main sewer clear of the river. Provision was made for carrying the accumulated water into a main covered sewer to a distance from the town, where it was proposed to prepare it for agricultural purposes. An attempt was made to execute a part of this plan under the resident surveyor, who at the start committed a blunder amounting to two feet in the level of the first sewer he attempted, which caused an extensive stagnation of the water. The council of the borough, under whom he acted, became alarmed at the want of success, and stopped further procedure. Sometime after, with a new council, a proposal was made to follow out Captain Vetch's plan. I was present on one occasion for nearly six hours listening to a debate on this important subject, and much was said to satisfy me that such Court acting alone was most incompetent for judging and determining on such matters. The chief theme of the speakers, in opposition to the adoption of the plan of Captain Vetch, related to what they very erroneously supposed to be the means of saving the pockets of the rate-payers, with very little regard to sanatory results. The mover and seconder were the only parties who supported the motion for adopting Captain Vetch's plans. A counter motion was made and carried to consider a plan by their own surveyor, which plan was more calculated to save outlay than to insure efficiency. The main sewers by this plan were intended to discharge their waters into the river at several points as heretofore, thereby continuing the pollution and losing the benefit of the sewer-water for agricultural purposes. The application of sewer-water for agricultural purposes being in some degree a new subject, new at all events to the councillors of Leeds, their inattention to that point is less to be wondered at; but the complete sewerage of the streets and alleys, and carrying the discharging point of the main sewer to a distance from the town, are points which almost all can judge of and appreciate. A careful economy in the expenditure of public money is most necessary; but health and capacity for labour, and even the comforts of a large labouring community, are now proved to be means to the production of wealth; therefore even to adopt inferior and incomplete plans for public works is a miserably narrow-sighted and false economy indeed, whilst it inflicts on the poorer classes an amount of suffering and misery not to be estimated in pounds, shillings, and pence. Those who, from whatever motive, obstruct the progress of such improvements as tend to the advancement of the moral and physical condition of their fellow men, incur a heavy responsibility of the waste of life as well as of money.

The recent Improvement Act for the town of Leeds has been drawn with a greater desire to improve the condition of the working classes, and the general health and comfort of the inhabitants of all classes, than

has been shown in any other Improvement Act which has come under my notice, and the details are more founded upon right principles, and more minutely given than has hitherto been done; still there is a want of completeness. But it matters not how ample the powers confirmed by an Act of Parliament may be, or how complete and perfect soever the detail, if the executive be not so arranged as to be effective in carrying out the law. This can only be attained by a board of limited number, rendered independent of immediate popular clamour, though amenable to public opinion, well officered, and under some general supervision and control, as well to urge as to restrain, and whose intelligence shall, from constant and extensive experience, be ripening with the advancement of the general improvement of the age.

The benevolent institutions of Leeds, for the amelioration of the sufferings of the poor and unfortunate, are numerous and well conducted; but as in disease, and poverty and wretchedness, as in all evils, prevention is of more importance than amelioration or cure, so should the efforts of the intelligent, the benevolent, the rich, and the powerful of a community, be directed to the root of the evil. Remove all apparent physical causes of ill health and discomfort—remove the moral pest, ignorance, by giving timely and complete education in that simple class of substantial and practical learning which is best fitted for the working classes, and promote as far as possible a frequent and kindly intercourse by the middle and higher classes, with the bulk of the working people. Go into their streets, and their alleys, and their courts; form a personal acquaintance with them; notice their little excellencies, gently reprove their rudenesses; magnetise them, if I may so speak, with the contact of a better class of manners; engage their sympathies; let them know that a gentleman has softer and kindlier attributes than those of the necessarily stern magistrate, strict master, and driving manufacturer. You may in the outset meet with some disagreeable individuals, some taunts, some insolence,—but persevere; and as your intercourse increases, you will soften down all jealousy, refine all rudeness, and gain the confidence and affection of the many. I may state that, when the object of my investigations was understood, I was well received by the inhabitants, and so will all be who go with the like errand.

Until, however, the localities of the abodes of the working classes are rendered more approachable to the higher classes of their fellow citizens by the removal of the many disgusting objects of sight and smell which abound in every quarter, it is in vain to expect that any useful intercourse can be maintained. I learned that a few clergymen and missionaries, and occasionally some benevolent females of the middle classes, made transient visits to the abodes of the sick and the wretched; but I could not find that any general intercourse was anywhere maintained, or that any heed was given by those benevolent visitors to any attempt at the amendment of the deplorable association of filth and malaria in which the poor people were left. It seems that they invariably rushed from the disagreeable and disgusting locality as soon as their labours of charity were completed. The removal of the surrounding disorder they deemed as not in their province; though in reality even the evils they came to mitigate might, in a great measure, have been prevented by a timely attention to the removal of the primary causes.

REPORT *on the* CONDITION *of the* TOWN *of* BRADFORD.

By James Smith, Esq., of Deanston.

Houses, 7,246; population, 132,164; deaths, 2·4 per cent.; excess in number of deaths in 1841, 696; average age of death, 20 years 3 months; of adults, 50 years 7 months; proportion of deaths of infants under 5 years to total deaths, 50·8 per cent.

The town of Bradford is situated in an irregular valley in the West Riding of Yorkshire. A stream, called Bradford Brook, intersects the town, and, from obstructions to the free flow of the water in its natural channel, by the erection of mill-dams and the encroachment of houses, it frequently overflows the lower part of the town, causing much havoc in the cellars and lower floors of shops and dwellings. There is sufficient fall for the natural drainage if it was not so obstructed. The principal part of the town stands on a steep hill-side, running towards the east. The extent, upon a level with the margin of the brook, is long but narrow. On the west the town rises also upon a hill-side of considerable steepness. The main streets are narrow and confined, and rise towards the summits on both sides. Some of the smaller cross streets are extremely steep, so that in many places the moisture from the dungsteads of the upper houses drains into the cellars of the houses beneath.

In one street, where some houses of a better class have been built, the one rising above the other on the steep, the drainage of the upper houses falling in upon those below, causes constant ill health to the inhabitants, and fever is seldom absent from the locality. Near this locality, in a low cellar, I found a wool-comber, with his family. He told me he had formerly lived on the heights, in a dry situation, where he and his family enjoyed a fair share of good health; but that since they came to live in the cellar, they have been visited with much sickness. He said he had come to that house for cheapness of rent; and I was able to show him, by reckoning up all the loss of wages from the sickness of himself and family, which he detailed to me, that he was a loser to a greater amount than the whole rent of the healthy house he had formerly occupied. He said he saw the force of what I said, and declared that he would look out for a house better situated. One beneficial effect of giving the people greater intelligence, by a more complete and proper education, would be to enable them to appreciate the importance of placing themselves, as far as possible, in localities favourable to health.

The general state of the surface of the streets of Bradford is respectable, but in most of the inferior and cross streets chiefly inhabited by the working classes, the condition is quite otherwise. Few of those are paved at all; none of them properly. In some streets a piece of paving is laid half across the street, opposite one man's tenement, whilst his opposite neighbour contents himself with a slight covering of soft engine ashes through which the native clay of the subsoil is seen pro-

truding, with unequal surface, and pools of slop-water and filth are visible all over the surface. The dung-heaps are found in several places in the streets, and open privies are seen in many directions. Large swill-tubs are placed in various places by pig-feeders for collecting the refuse from the families, for which they pay in some cases from 1*d.* to 2*d.* per week.

The main sewerage of the town has been very defective, but some movement has been made of late in executing some sewers in better form in some of the principal streets. The chief sewerage, if sewerage it can be called, of the inferior streets and of the courts, is in open channels, and from the rough and unequal surface of the streets, the flow is tardy, and the whole soil is saturated with sewage water. The main sewers are discharged either into the brook or into the terminus or basin of a canal which runs into the lower part of the town. The water of this basin is often so charged with decaying matter, that in hot weather bubbles of sulphuretted hydrogen are continually rising to the surface; and so much is the atmosphere loaded with that gas, that watch-cases and other materials of silver become black in the pockets of the workmen employed near the canal. The stench is sometimes very strong, and fevers prevail much all around. Taking the general condition of Bradford, I am obliged to pronounce it to be the most filthy town I visited; and I could see no symptoms of any improvement in the more recent arrangements for the abodes of the working classes. The scavenging of the streets is but indifferently done, and a depôt for receiving the scavenging of the streets and other filth has been established in the very rear of the Court House where the authorities meet.

The chief slaughter-house is in the middle of the town, and forms a most decided nuisance to its immediate neighbourhood. The sewerage is defective, and the supply of water for cleansing most deficient.

The supply of water for the inhabitants is very limited; but an Act has just been obtained by a joint stock company for procuring a better supply. At present a great part of the town is supplied by water-carriers, who bring the water upon carts and upon donkeys, and charge a halfpenny for three gallons, which is most expensive, especially to the poor inhabitants, and forces an economy in the use of this most important element highly injurious to health, cleanliness, and comfort. In the lower part of the town I found a butcher using water from a well freely in his premises, the effect of which was, that all disagreeable smell was removed; and the facility and quickness with which he cleansed the whole of his place and the flagged pavement in the street in front of his premises attracted my special attention. I estimated from his operations that a street, 60 feet wide and one mile long, could be thoroughly washed for 7*s.*, including cost of water, charged at such price as it can be furnished for almost everywhere.

Mr. Clough, town clerk and clerk to the Commissioners of Highways, who takes charge of the streets and sewerage, has given in a very excellent paper on these subjects, and shows clearly the want of a proper system of management. Mr. Clough's report will be found in the Appendix.

The schools in Bradford are in general well conducted, and in some cases the school-rooms are well ventilated: upon the whole, there

seemed too limited an extent of school accommodation for so large a community.

More has been done in Bradford towards the diminution of the smoke nuisance than in any other town which I have visited. Most of the extensive manufacturers have applied some one of the many plans for consuming the smoke of their steam-boiler furnaces within the last three years; and I was informed that at one time the whole of the plans worked with more or less beneficial effect; but at the time I visited Bradford the greater number were out of order, some from one cause and some from another, and volumes of dense smoke were seen pouring out all over the town. On inquiry, I found that some of the apparatus were rendered ineffective by the breaking of a connecting wire, and some by warping of the iron plates from extraordinary heat; whilst all admitted that their respective furnaces worked well for raising steam by all the different plans, and that there was an undoubted saving of fuel from the use of the smoke-burning apparatus varying from 5 to 20 per cent.; but that from ignorance, carelessness, and some dislike on the part of the men employed as stokers,—from some small failures in the apparatus which there was little care to remedy,—from the want of some practical method of proving the neglect by technical evidence so as to bring the defaulters to punishment,—from the want of proper police arrangements and authoritative provision by officers responsible for taking measures for the protection of the public, notwithstanding the actual and undoubted general saving of fuel by the manufacturers by a better composition which diminished the smoke, the regular working of the apparatus was not generally effected; and that which was proved to be practical and beneficial was left unregarded. In the course of the examination of these places, and under my personal communication with the manufacturers, it was too frequently observable that many of them appeared to consider that it was not enough to prove that they did not lose money by the better consumption of their fuel and the consequent diminution of the smoke, or that they had some small amount of gain; many appeared to think that it must be shown that the gain was so large as to make it "worth the while" in their own estimation to be at the trouble of the change; no account being taken of the inconvenience and loss to which they subjected their neighbours or the surrounding population by the soot which they spread about them. As an instance of the difference between a smoky and a comparatively clear town, I may mention that a thrifty man at Hull, who had lived at Leeds, which suffers very severely from the excess of smoke, stated that he found he required one-third more of washing at Leeds than at Hull to keep his linen equally clean. Similar household observations have been made by persons who have resided in the neighbourhoods of ill-regulated furnaces and in towns comparatively free from them. There was expressed generally a belief that until some authoritative supervision shall be established, there can be no practical improvement obtained. In a town of such extent as Bradford, the immediate supervision might be placed in the hands of the police of the place, or, in the event of there being no police, in the hands of one or more special officers appointed for the purpose. As to a practical method of ascertaining the amount of smoke, several have been suggested. The only practicable mode of ascertaining the degree of

smoke issuing which I have yet met with is that of having the representation of various degrees of shade printed in a book from a copper plate or lithographic stone, and these being numbered, each policeman or other watcher to have one of the books in his pocket; and taking it out when he sees smoke issuing improperly, he could at once fix on the number nearest the appearance of the smoke, and could give evidence accordingly. It matters not what laws are enacted to cure this or any other evil, unless a practical mode of detecting transgressions be adopted, and arrangements be made and persevered in for a constant vigilance, with an interest for detection given to the officers, and with a steady supervision over the whole. The police officers of a town are the best agents for observing and informing; and in peculiar localities, and under peculiar circumstances, local observers could be appointed, with a small weekly allowance over and above the premium for detection.

The factories for the worsted manufacture chiefly, seemed well regulated, and the children are healthy-looking. The wool-combing is admitted to be a very unhealthy employment. The wool-combers assort the wool chiefly in an apartment of their own dwelling. The work is done over a fire of charcoal, which sends forth volumes of carbonic acid gas, and the work-people are obliged to keep their windows open in all weathers to prevent, or to mitigate, the evil effects of the gas. They are roasted to perspiration on one side, and have often a current of cold air rushing upon them from the window. They look pale and cadaverous, and are short-lived, few reaching 50 years of age. Their roasting employment and exposure to the carbonic acid gas gives them a desire for spirits and opiates, and it is probable that the frequent free use of these may have some considerable share in shortening their lives. In some instances, where they have been brought to work together in factories, their health has been improved, and their habits have become better regulated.

When trade is good, the working people of Bradford make good wages, and they live well, so far as eating and drinking goes; and many have a taste for good clothing and good furniture in their houses, and save a little money; but the great bulk "make the day and way alike long." Many of the dwellings are built by building clubs composed of the working people, and they present little or no improvement in the mode of their construction.

REPORT *on the* CONDITION *of the* TOWN *of* SHEFFIELD.

By James Smith, Esq., of Deanston.

Houses, 25,000; population, 85,076; deaths, 2·7 per cent.; excess in number of deaths during the year 1841, 721; average age of all who died, 22 years 6 months; of adults, 51 years 6 months; proportion per cent. of deaths of infants under 5 years, 49·7 per cent.

The town of Sheffield stands chiefly on the right bank of the river Dun, at the confluence of the Sheaf, flowing towards the valley of Rotherham. The greater part of the town rests upon a ridge, rising

to a height of about 200 feet above the river, and inclining beyond this ridge to another valley. A small portion of the ground, near the river side, is flat and low, and is liable to be flooded occasionally. The greater part of the town stands on the rising ground, the aspect of the chief part being south-east. The streets in the old parts are irregular and narrow; but having, in general, a considerable declivity of surface, they are both better ventilated and better cleansed by rain than the streets of most towns. The newer parts are laid off with more regularity. The streets are of moderate width, and are in general paved in a superior manner with gritstone blocks. The surface is kept even by constant attention and by cutting down any stones which rise above the general surface, or which do not wear so fast as the others.

The natural flow of the water, both of the Dun and the Sheaf, are much obstructed by mill-dams, the power acquired by which can be of no great value in a locality where coals are plentiful and cheap, whilst the obstructions they cause are of serious injury to the proprietors and inhabitants of the lower parts of the town. In the dead water caused by one of these dams, near the principal bridge, I saw the decaying carcases of several animals in association with a mass of filth from the sewers, which there discharge their contents into the river. A short distance below the bridge are the chief slaughter-houses, from which a deal of filth and putrid matter is constantly flowing into the river; the grosser matter is collected into dung-steads, in which pigs are kept, and are fed on parts of the viscera and other rejected parts of the slaughtered animals. The ways passing along the fronts of the killing-houses are roughly paved, having open gutters full of putrid matter. The chief part of the blood is saved in casks and sold to the farmers of Lincolnshire as a manure, at 1*d.* per gallon.

The under surface drainage of the surrounding country is very imperfect; indeed, the drainage is chiefly superficial; but from the generally steep declivity of the surface, the bulk of the water falling as rain soon passes off.

The sewerage is not carried so thoroughly out as it ought, but what has been done of late has been done well, on proper principles, under the direction of Mr. Lee, the surveyor of the town; and affords an example of the advantage of having a competent surveyor. I refer with satisfaction to a paper by Mr. Lee, given in the Appendix, on the subject of municipal arrangements, surveyorships, &c. Stones are used here for building the sewers, and which are generally made flat in the bottom and top, and are of comparatively small dimensions; but from the declivity of the surface, and the skill and care with which the work has been executed, they have been found quite sufficient, and have never been found to sludge up in any part. There are few house-drains, and none of the gully-holes are trapped. The streets are regularly swept and cleansed under the authorities, and the refuse is carried off by the scavengers and deposited in a dung-yard in the lower part of the town, where it is made up for sale. The scavenging costs about 900*l.* per annum, and about 600*l.* is got for the dung, &c. The steep declivity, the smooth and uniform surface and washing by the rain, and the absence of any dirty debris from the manufactures of the town, give it an air of cleanliness which is very agreeable, and so far it may be called a clean town; still there are many portions where the working classes

reside confined, ill-ventilated, ill-drained, and filthy. In general however, the dung-steads and privies are more tidily kept than in most of the towns visited. The people themselves seem, in general, cleanly in their persons and houses, and have rather a healthy appearance. It appears, however, from Dr. Holland's excellent book on the "Vital Statistics of Sheffield," that several classes of the operatives are sickly and short-lived, especially fork-grinders. The statistical tables relative to Sheffield, given in the Appendix to the First Report, may be consulted.

Here, as elsewhere, the greatest amount of sickness prevails in undrained, ill-ventilated, and filthy localities. There is a flat and ill-drained portion of the town, on the south side of the river, where much fever prevails. The streets in this portion of the town are frequently covered with water several feet deep during floods, and many low dwellings are inundated, so that much danger and loss arises to the inhabitants. The houses are left damp and uncomfortable, and sickness, especially fever, always follows.

There are some cottages lately built for the working classes, which are of a very good construction. These houses are built back to back; but so well are they arranged that they have a good ventilation. The dung-steads and privies for the houses, both of front and rear, are in a roomy, open back court, and are as little of a nuisance to sight or smell as such objects can be; still they form an example of the unsuitableness of having any receptacles for an accumulation for weeks of the ashes, slops, and excrements so near to dwellings, or anywhere within the precincts of a town. The flagging of the courts is smooth and substantial, and kept clean by frequent thorough washing, for which water is supplied abundantly from a stand-cock in each court.

The sewer-water is discharged into the river, polluting the stream, and is lost for agricultural purposes. Part of this sewer water might be carried by gravitation to some lands a few miles distant for irrigation, and the water of the lower sewers might be pumped at no great expense to the level of the point of discharging the higher water.

Water is supplied in sufficient abundance for domestic purposes, but has not been used for cleansing of streets or sewers. It is acquired from surface drainage and from springs seven miles distant. The water is of good quality for all domestic purposes, but it is not properly filtered; and when I visited, the water served out as the water of the company was of a very bad colour, which was stated to be its common character. When water is received to a proper depth by thorough and proper drainage, it has passed through a natural filter and comes out comparatively pure from all such matters as are carried away in suspension by ordinary surface drainage. The expense and inconvenience of filtering all hill-side waters is so little to companies that it ought at all times to be required wherever there is not a proper filtration by thorough drainage. The better classes have the water carried by pipes into their houses, and the lower classes are supplied chiefly by stand-cocks adjoining their houses; they made no complaints of wanting a sufficient sup though it is evident that water supplied at intervals, as here, can n fully answer. Here the people have to fill tubs, in which the water o stands exposed to the sun and dust for a couple of days. The neces of having these tubs and tanks, besides occupying space, which i importance in such a town, more than doubles the owner's and consum

expense for apparatus. The water has been analyzed by Mr. West, of Leeds, and is of excellent quality. It is supplied by a joint stock company. There are 25,000 houses in the town, and 19,000 are supplied with water. The charge is 7½ per cent. on the rental, being from 8*s.* to 10*s.* per house per annum, or about 2*s.* per head, which is less than ½*d.* per week to each individual. The water is on every day in some parts of the town, and three times a-week in the other parts. In the pipes, in the lower parts of the town, there is a pressure of 460 feet, and fires can be extinguished by a hose-pipe from the main. No material inconvenience is felt even from the very high pressure in the lower parts of the town.

Gas is supplied by a joint stock company in abundance, of good quality, and at moderate rates. The working classes seldom take gas into their houses. The alleys and courts are not well lighted; and I may here remark that it is of great importance for the cleanliness, police, and moral order, as well as for the personal comfort of the inhabitants, that every street, court, and corner be well lighted at night. Besides, serious accidents frequently happen to the working people from a want of light in the courts and alleys as they go to and return from their work in the dark during six months of the year, except during clear moonlight.

The affairs of the town were formerly managed by the master cutler and a council; now there is a mayor, aldermen, and council under a newly acquired charter of incorporation.

The powers given by the Improvement Act are considerable, but still unsystematic and incomplete in many points for enforcing sufficient drainage, sewerage, supplies of water, lighting, &c.; nevertheless, there are powers to admit of a very extensive mitigation of the evils affecting the health and comfort of the people, provided the authorities do their duty fully with a constant care, and competent parish and responsible officers are appointed and supported to exercise that care.

The police establishment is small, but effective. They take cognizance to a certain extent of cleansing in the streets, but private courts, though open, are stated to be out of their jurisdiction.

The lodging-houses are looked to by the police when any suspicious characters are about, but there are no regulations as to cleansing, nor as to the numbers of persons permitted to sleep in an apartment. The rooms are often crowded to suffocation, the whole floors covered with beds; and to add to the evils, the lodging-house keepers are often purchasers or collectors of rags; and heaps of filthy rags stowed away in corners and closets. Diseases of the worst type are frequently generated if not brought into these lodging-houses, by vagrants and trampers, and remain undiscovered for days and weeks for want of a regular survaillence.

The smoke nuisance here is not great, as the smoke arises chiefly from small fires, widely distributed over the town; and there is but a small proportion of large steam-engine chimneys. Nothing seems to have been done, however, to lessen the nuisance from the degree in which it has existed for years.

There are no public gardens or open space of any extent for the people to walk and enjoy themselves in, but the country is open and hilly, and there are public roads in all directions. There is a peculiarity connected

with this town worthy of notice, namely, that the operative cutlers keep a pack of hounds, with which they are permitted to sport over the neighbourhood, which they do occasionally on foot, and with great discretion.

The working classes I found quite alive to the objects of the Commission, and such of them as I came in contact with afforded every information and facility, and expressed an anxious desire to be relieved of the filth; and, as a proof of their desire for cleanliness, I found the seats of the open privies in courts in many places cleanly washed.

There exists in the lower part of the town one very obvious and most unhealthful nuisance, which appears to have remained hitherto unnoticed by the authorities. It arises from the existence of an old mill race, which has been long abandoned; its outlet is closed, and it now remains a receptacle for sewage water and filth. A number of little courts of inferior houses are situated along the margin, and in some places a row of poor houses on the very brink. The locality is altogether unhealthy, and the seat of fever, whenever there are any cases of fever in the town.

Complaints are made of the offensive nature of the interments within the town. One churchyard in the middle of the town is peculiarly offensive. It is very much crowded with bodies, and as the soil is considerably above the level of the surrounding street, the exudation of putrid liquid from the soil is visible to the eye and offensive to the smell. The soil being of a tenacious clay, the decay of the bodies is slow; and where graves are opened, the skeletons are often found still articulated, and their exhumation is most offensive to the inhabitants residing within sight of the burial-ground. A cemetery has just been established at some distance in the country by a joint stock company, under good regulations. It is beginning to be resorted to, and it is to be hoped that the bulk of the interments will hereafter be made in this or some other similar place; for whether we consider the health and comfort of the inhabitants, or the softer feelings of the relatives of the dead, or, generally, feelings of public decency, we must approve of the arrangements of having burial-places in a remote and undisturbed locality.

REPORT *on the* CONDITION *of the* TOWN *of* HALIFAX.

Population, 109,175; deaths, 2·1 per cent.; excess in the number of deaths in the year 1841, 266; average age of all who died, 26 years 10 months; of adults, 53 years 9 months; proportion per cent. of deaths of infants under 5 years, 41·6 per cent.

The town of Halifax, in the West Riding of Yorkshire, stands on the sloping banks of the Hebble, a small stream flowing towards the Aire. The site of the town is situated very nearly in the middle of the county, and is elevated about 500 feet above the level of the sea.

The banks rise very steeply, and especially on the east, where they reach to a great height, and look almost like a wall rising above the

valley. The under strata consist chiefly of a hard gritty sandstone rock, of the coal formation. The immediate surface is generally a strong clay, especially in the lower range of the valley, but assumes a lighter nature towards the heights.

This town is in part very ancient; but the increase of population has been greatly extended during the last 30 years, by the prosperity of the manufactures of the place; these are chiefly worsted spinning, and weaving, with an extensive manufacture of cards for carding cotton, wool, and flax.

From the features of the surface, the streets are in general steep, and being, upon the whole, well paved, they are much washed by rain, and except in some of the low and narrow streets, the ventilation and cleanliness are rather of a good order. The river or brook is much obstructed in its flow by the existence of many weirs erected from time to time for mill purposes, and, of course, the main drainage is not good although the natural capabilities are very ample. From the steepness of the sides of the valley, and the rapid fall in the channel of the stream, there is but a limited portion of the site in a low, flat, and damp condition. The streets are partially sewered, but still there is a great want of thorough under-sewering.

The streets are irregular in direction and width, with the exception of a few more recent streets which have a fair width, and are less steep. Other new streets on the rising ground are steep and winding; the latter are, however, well ventilated from their position, and there being little traffic on the well-paved streets, they are clean and tidy; with the fault, however, of much of the sewerage water having to run in open gutters. Near the margin of the river there are some damp, wretched-looking dwellings, and there is in some localities a class of dwellings for the lower orders called *folds*, which are a sort of courts or enclosed spaces. Most of these folds are very damp and filthy; the seats of poverty and disease. Such localities in every town are invariably found to be inhabited by the lowest grade of the working people; but who in the case of Halifax, though in the midst of filth, and with a low state of finances and morals, are nevertheless inclined to be cleanly and tidy, but are kept in a depressed condition by the outward filth and effluvium which assails them at every step. Houses of this class generally belong to public-house keepers, or a class of operatives who have contrived to save a little money: sometimes to building clubs.

The publican wishes to have around him not the most provident class. The small tradesman, penurious in his habits, will not expend a sixpence for the comfort of his tenant beyond necessity; and the building clubs being composed of many, all having a personal interest in the gains, but none in the comfort of their tenants, will not allow of any expenditure beyond what will secure tenants for the property, so that the drainage, ventilation, and cleansing are left to chance, as the public authorities take no notice of such localities.

The supply of water is from wells in the town, and from reservoirs erected by a water company, at some distance in the country.

The water is of fair quality, and, upon the whole, rather abundant, though far short of the supply necessary for thorough cleansing.

I found that the people of Halifax use water more liberally for washing their windows and floors, and even in many instances for washing

their lanes and streets, than in any other town I visited. There is no very efficient means for extinguishing fires by a jet from the service-pipes or main; but, from the position of the town, the water might, by proper arrangements, be used for extinguishing fires by jets, and for washing the streets.

The town is very well supplied with gas. Still few or none of the working classes take it into their houses, and the streets are barely lighted. In some places here I found great receptacles for ashes and filth in cellars under the houses, and from which the manure was not removed more than twice or three times a-year.

The health of the general population is, however, good for a town population. In one locality it is remarkable that in a class of cottages situated in the higher ground, or country district, there is more fever than amongst the population of the town. The medical men attribute this very much to bad drainage—to the inhabitants having filthy muck holes in front of their houses, and to the cold and more exposed position of the locality.

Most of the young population are employed in the worsted factories and in card making. It has been generally observed, that persons employed in the woollen or worsted manufactures are more healthy than those employed in cotton.

There is an infirmary of recent erection, an elegant and commodious house, where great attention is paid to the patients, and to this excellent institution is attached a dispensary. The older infirmary building was situated in a low part of the town, where the drainage is bad, and the situation confined and airless. There the hospital fever often prevailed, and surgical cases were most difficult to cure, as I was assured by the medical men, from the effects of contaminated damp and miasmatic atmosphere. Ever since the patients have been received in the new building, there has been a complete change. The recoveries have been more rapid and sure, and surgical cases proceed in most instances satisfactorily.

Notwithstanding, however, the many excellent general arrangements of this building, the sewerage is of the old, common, unsatisfactory kind, the drainage from the water-closets, sculleries, &c., is carried under the floors of the rooms and passages of the lower flat, in common built sewers (not pipes), with cesspools, and the consequence is a constant emanation of bad smells, very much complained of by the house-keeper and her assistants.

The evil must more or less affect the patients, for the air from this lower flat pervades the whole house; though, being more diluted in its passage to the upper floors, the smell is less perceptible, and the vitiated air less hurtful.

The use of cesspools of any description is quite inadmissible, where purity of air is required, and wherever human beings exist such is required.

It frequently happens that where a small quantity of contamination is gradually but constantly emitted from cesspools, no obvious bad smell or effluvia is perceptible to common observers, still the surrounding atmosphere becomes sufficiently contaminated to produce in most constitutions a lowered tone of health, with very baneful ultimate effects to those long exposed to its influence.

The slaughter-houses of Halifax are situated in a large quadrangular space in the middle of one section of the town. The general arrangements are better than in most towns; yet there is much of the usual offensive and hurtful character of such establishments. The smell especially in the warm weather of summer, is much complained of by the neighbouring inhabitants, and the emanations from the putrid matter must influence their health to a considerable extent.

The sewer-water is in general discharged into the brook; the water of the brook is used to a limited extent at several places for irrigation, and although often much diluted with rain-water, it has a most beneficial effect. A steam-engine has for many years been at work for pumping the water of the brook in all states, however impure, for supplying a canal; and although the water of this brook often contains as much matter in suspension as the sewer-water of any town, it has been regularly pumped in large quantities to a height of 100 feet, without the slighest injury to, or difficulty with, the pumps; affording an excellent example of the practicability of pumping away the sewer-water of towns for agricultural purposes. In a subsequent paper on the subject of the application of sewer-water for agricultural purposes, I have availed myself of this example.*

The smoke nuisance is in no way materially abated; and, from the number of factories situated in the low part of the town having steam-engines, there is much smoke in the atmosphere at all times when they are at work, and which dwells very much in the locality, from the enclosed nature of the valley.

The general features of Halifax are favourable to health. Sheltered from the east and west winds by the rising ground immediately enclosing the valley, and having a rapidly sloping surface to carry off the rain-water, it wants but a better sewerage, especially in the lower parts, and greater attention to the frequent and regular removal of the filth, to render it an agreeable and healthful residence.

General Observations on the present Condition of Large Towns, as regards the Health and Comfort of the Inhabitants, and the means of Improvement. By James Smith, Esq., of Deanston.

The general defects of all the towns which I visited under this inquiry were—

1. Defect of areas for works of drainage, and consequent defect of the requisite extent of jurisdiction to enable any local administrative body to carry out such works properly.

The natural area as regards drainage was not in any case within the prescribed limits, and there is a difficulty in obtaining that free outfall which is essential to good drainage, and in many instances the drainage from the higher grounds is thrown upon the site of the town in such a manner as to cause much damp and inconvenience; whereas, if it were under the control of the proper authority, it might be converted from a bane to a benefit, by directing it into the sewers at proper points,

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* Report on the Application of Sewer-Water to Agricultural Purposes.

so as to assist in scouring them out or for supplying a sufficient dilution to retard putrescence, and fit the fluid for pumping and distribution. The obstacles to the natural drainage caused by weirs and other obstructions in the brooks and rivers is general and most injurious, causing the overflow of the sites of a portion of the houses in the lower districts in periods of floods, and preventing at all times the proper depth and efficiency of the discharging sewers.

Thus at Hull: that which is really one town,—Sculcoats as well as Hull,—is split into two clashing jurisdictions; necessitating double sets of officers, double superintendence to each, or excessively expensive establishments, inferior powers of execution, and a clashing in their action. Sheffield is another example: the town is cut up into two districts,—Ecclesall Bierlow and Sheffield.

For the sake of economical and efficient administrative arrangements, the collective mass of houses forming a town and the suburbs ought to be under one jurisdiction for these purposes, even if it happened to include in its site distinct drainage areas.

The drainage area ought to include its outfalls. From ignorance or from neglect, the public jurisdiction over the outfalls at Sheffield, at Halifax, at Leeds, and at Bradford, had been allowed to be encroached upon, and dammed up for mill power. These dams are made the catch-pits for the sewage of the town, and the effect of the miasma from the stagnant pools produced is most pestilential. The legal validity of these encroachments, I am told, admits of question, but inasmuch as small interests in possession, with apprehended loss, are much more active than any large public interest, it seems to be good policy for the sake of the population, that all such interests should be bought up liberally. By the poor people, when the nature of our inquiry was understood, it was everywhere well received. But a louring front was occasionally met with on the part of persons in a condition of life where it might not be expected: sometimes an aspect was exhibited of disapproval of interference "with local self-government," and intrusion; and allegations were heard that the people disliked to be interfered with, and liked dirt, and would not have their habits disturbed. Every such manifestation turned out to be from the possessor or sharer of one of these immense catch-pits, or some pestilential interest or other, which a complete system of cleansing and purification would apparently disturb. In the perambulation of the lower districts inhabited by the poorer classes, it was often very affecting to see how resolutely they strove for decency and cleanliness amidst the adverse circumstances; to see the floors of their houses and the steps washed clean, made white with the hearth-stone, when the first persons coming into the house must spoil their labours, with the mud from the street, kept filthy by neglect of proper scavenging; to see their clothes washed and hung out to dry, but befouled by soot from the neighbouring furnaces; and to see their children attempted to be kept clean, but made dirty from the like causes; and sometimes to see those children, notwithstanding all their care, pale, sickly, and drooping, evidently from the pestilential miasma of a natural stream, converted into a sewer, and dammed up for the sake of mill power, in the hands of persons of great influence in the return of members to the town council, who are deaf to all statements of evidence of the evil, or of the possibility of amendment.

2. What would follow as a consequence of defective areas in respect to the larger works,—imperfect works within the imperfect areas. In the towns examined, I found that there exists a general want of sufficient sewerage for carrying off the rain and sewerage water from the streets. A complete want, almost without exception, of such branch communications from the dwellings and courts to the sewers as would remove the nuisance and injury to health arising from putrid and offensive water and other matter flowing in open channels, and in most instances a total want of such under-drainage as is necessary to render the sites of the houses and of the streets dry.

In many instances either cellar dwellings having their floors from four to seven feet under the level of the surface, or dwellings having their first floors under the level of the ground or just level with it, are the chief residences of the lower grades of the working classes.

The depôts for the ashes and filth of the families are generally immediately adjoining the dwellings, open to view, frequently covering large spaces of the courts or streets, and with privies attached exposed in defiance of all feelings of decency, and in all most offensive to sight and to smell, and constantly emitting effluvia hurtful to health. The people in general are most sensible of the evils, and make every effort to induce the proprietors to have the nuisance removed or abated, but seldom succeed. The dung is in few instances removed oftener than once in six months, and then an extensive surface, exhaling offensive effluvia from the saturated ground, is left exposed.

There is want of a well-regulated system for the regular scavenging or otherwise cleansing the alleys and courts, and in general a want of power to have cleanliness enforced and nuisances removed from private courts and premises:

A want of power or arrangement for cognizance of such by the police, whose interference is chiefly confined to such matters in the public streets only:

The want of sufficient and constant supplies of water at high pressure for ordinary domestic purposes, and for more thorough cleansing:

A want of sufficient lighting by gas in the alleys and courts.

There is a great want of width and openness in the streets, alleys, and courts, especially in those parts inhabited by the working classes. Houses are built without means of ventilation sufficient for the number of individuals generally living in each apartment.

Regulations for the enforcement of the formation of sewers and paving of streets in all cases of extension are much wanted.

A want of some general supervision of the public economy of large towns, whereby the complete and uniform action of the management of the various trusts shall be insured, whilst means shall be afforded for comparing the system of management and the modes of working, and the cost and the results of one town with those of another, thereby leading to a knowledge of the best system, and to emulation amongst the towns.

3. These defective works are further aggravated by the defective powers of the existing local authorities, whereby the increments of the towns for the accommodation of the increasing population might be regulated.

4. Defective constitution of the local authorities.

It must not be concealed that the new works required for the improvement of towns require a degree not only of intelligence, but an amount of sustained attention too great to be treated as an incident to the ordinary duties of town councils.

This was displayed in a marked manner at Leeds. There the excessive sickness and mortality arising from defective administrative regulations had been demonstrated by Mr. Baker, surgeon, resident at Leeds, in a report which had been widely promulgated. He had demonstrated the identity of the cholera track and the fever track precisely in the line of bad drainage, bad public cleansing, close, crowded, and ill-regulated habitations.

The chief remedies had been demonstrated to the satisfaction of the mayor and a number of gentlemen of education in a very able report by Captain Vetch. He had demonstrated the falsehood of the cry of "increased rates;" he had shown that the whole might be accomplished with a considerable ultimate reduction of the existing charges.

But neither the demonstration of the evils nor of the remedies has availed the population. A local Act had been procured, but with defective provisions; and those provisions, executed as self-acting and unsupervised laws are everywhere found to be, and are proved to be by the actual existing state of evils intended to be remedied. And that scientific demonstrations in general, such as those with relation to areas of drainage, trigonometrical surveys, the laws of gravitation, or the laws of hydraulics, involved in the cleansing of towns by the removal of matters in suspension in water, the application of these principles to the maintenance of supplies of water at high pressure, a principle, simple as it is and fully demonstrated, is yet not so popularly understood that those who suppose they have an interest against the extension of reservoirs and the necessary works may not for some time be successful in denying them, we might fairly expect that they will be of little avail with unscientific persons, such as, without disparagement to their respectability as citizens, the members of town councils may be stated to be.

But were it otherwise, and however well appreciated such works might be locally, yet they would require a very laborious supervision. To put a stop to the smoke nuisance at Bradford properly and easily might require the attention of a person of sufficient science to understand the management of fuel in furnaces; but if any unpaid functionary, possessing such qualifications, were to give the labour requisite for the proper performance of the duties in question, though he might save from 5 to 15 per cent. in the manufacturer's consumption of fuel, and an immense sum in extra washing and wear and tear of clothes to the inhabitants, he would probably be set down as a madman. Another element which presented itself as a serious barrier to the carrying out of local works by the authorities as at present constituted,—namely, party divisions. At Hull, when I visited the town, and paid my respects to the mayor as a public officer, without knowing nor thinking it my duty to notice of what political party he was, and made inquiries of the municipal officers, and perambulated the poorer districts with them, I found that this very innocent act of mine was regarded by very respectable persons, but an anti-corporation party, as "taking a side."

The supplies of water for the town I found had been for a long period in the hands of the corporation. They had recently obtained an Act for the extension of the supplies of water. Into the particulars of the mode of supply I had not time to enter; but that a considerable extension of the supply was required for the general use of the population was obvious to me. Nevertheless, I found that the extension of the supply was deemed a party measure, the sufficiency of the existing sources strongly contended for, and the measure was bitterly opposed by many respectable persons. By the Act, the profits derivable from the water rents are limited to 6 per cent. on the outlay. I had no time or means to inquire into the propriety of this outlay; I heard no specific allegations against it, and presume that it was unimpeachable or satisfactory. Nevertheless, we must not shut our eyes to the general examples of extravagant expenditure we have had in local public works; and supposing this particular work to be well managed, what is the general tendency? A corporation of any political party might very easily double the original outlay for the works or the staff of officers or turncocks for their management, and it was impossible not to feel that the rate-payers might be more cheaply served in the long run, if the whole service of the water supply were let out on contract for a term of years, and that the whole arrangement would have worked more satisfactorily to the extent to which it was freed from party influences. The supply of water was intermittent. The advantages of a constant supply of water in the reduction of the tenants' expenses of tanks, in the readier means it afforded for private baths, and for cleansing streets, had not been seen or provided for.

From all these considerations it was evident,—from the state of the areas, the jurisdictions, and the works in the towns, which I visited,—that very special local arrangements, freed, as far as possible, from party conflict, would be required to carry them out. The feeling of distrust of the inhabitants against any new rates or expenditure, derived from their experience as to past expenditure, is one of the most effectual bars to the advancement of improvement, leading to narrow and contracted views on all points, and disposing to the adoption of cheapness and saving with necessary inefficiency, in place of liberal views and efficient plans and operations. If it is possible to find the necessary pecuniary means without a rate, the chief difficulties would be removed. I have submitted in a separate paper my views of the facilities of obtaining large pecuniary resources by the application of the sewer water.* With such source of supply there will be no difficulty in designing, executing, and keeping up a most perfect system as far as our present views extend, of works and regulations for securing the greatest amount of health and comfort which can be attained for the inhabitants of large towns.

If a rate must still, under some circumstances, be resorted to as the only source, or as a helping source for procuring the necessary funds, the adoption of the principle of dividing the charge over a series of years, and raising the money immediately required by loan on security of the rates, will greatly diminish the immediate pressure, and so far remove the hostility of the rate-payers to necessary and efficient works

* See Report on Profitable Application of Sewer Water, p. 21.

of improvement. Besides, substantial justice will be done to life-renters, many of whom have no other source of living but by a limited amount of rent drawn from house property. Nevertheless, I believe that this jealousy might be abated by a properly adjusted and revised system of contract management, which would be cheaper than any other.

As against new expenditure we have to set the actual existing expenditure, the existing charges for the cleansing of cesspools would in general, under a system of contract management, suffice for the laying down an improved system of soil-pans and drains, and carrying water into every house to cleanse them. It certainly would be so at Hull. Then there is the enormous waste of productive labour in excessive sickness and premature deaths. To display this, I have thought it convenient to adopt the same heads of returns of sickness and mortality during one year that have been adopted by my colleague, Dr. Lyon Playfair, for the display of the expense of premature mortality in the several towns and districts of Lancashire, with which those I have examined may be compared. Though the mortality of some of the town districts appears to be greater than might be expected on a cursory view of them, yet it is in general coincident with the physical condition in which the population is found to be on a close examination, and there can be no doubt that by proper measures of water supply to the houses, proper house-drains and cleansing, the entire suppression of cesspools, the removal of grave-yards and slaughter-houses, and the suppression of the smoke nuisance, and proper ventilation, the physical or sanatory condition of the population of town districts might be brought up to the condition of the present best conditioned rural district in each part of the country; for in those districts themselves the drainage is imperfect, epidemic diseases are prevalent, and there is evidently much to amend.

From this table, the poor artisan at Bradford might see that, for a wretched tenement, he sacrificed, under a notion of saving, such as prevailed with the town council at Leeds, no less than 16 years' chances of life and money earnings during that time, estimating them only at 7*s.* 6*d.* per week, of 184*l.* The town council of Leeds may see that their year's excess of deaths from preventible disease in 1841 was 1169; that the year's funeral bill for this excess could not have been less than 5800*l.*; that the bill for the excess of sickness during that same year for the town is moderately estimated at 32,700*l.*; and that the loss of productive labour swept away by that one year's excess of mortality could have been no less than 317,000*l.* to the country.

REGISTRATION DISTRICTS.	Average Age at Death of all who Died.	Average Age at Death of all who Died above 20	Proportion per Cent. of Deaths to Total Deaths												Proportion per Cent. of Deaths to Births	
			Under				Between							90 and upwards	Under	
			1 Year.	5 Years.	15 Years.	20 Years.	20–30	30–40	40–50	50–60	60–70	70–80	80–90		1 Year.	5 Years.
	Yrs. Mo.	Yrs. Mo.														
Saddleworth, Eccles-field, Wortley, and Ecclesall Bierlow .	26 3	52 10	23·8	43·2	52·0	55·6	8·0	6·0	5·5	7·0	7·6	6·6	3·5	0·3	14·0	25·4
Sheffield	22 6	51 6	25·4	49·7	56·7	59·9	6·6	6·1	6·7	6·0	6·1	6·3	2·1	0·1	16·7	32·7
Rotherham	28 5	54 6	23·3	33·5	45·8	53·1	8·4	5·6	4·4	7·5	8·4	7·4	4·7	0·4	13·5	18·3
Wakefield	30 5	53 11	21·9	35·2	42·6	46·9	9·1	6·8	8·1	5·7	9·3	9·3	4·2	0·6	12·7	20·4
Huddersfield . . .	27 3	52 5	26·0	40·3	47·2	51·4	9·4	6·9	6·3	6·1	7·1	8·9	3·6	0·2	13·8	21·4
Dewsbury	23 6	52 0	28·2	46·2	53·6	59·0	7·7	6·6	5·6	4·9	6·4	5·7	4·0	0·2	14·1	23·2
Halifax	26 10	53 9	24·8	41·6	48·5	53·9	7·6	6·5	6·2	6·4	6·7	8·6	3·8	0·3	14·1	23·6
Bradford	20 3	50 7	29·5	50·8	58·9	64·6	7·7	5·2	4·5	5·3	5·1	5·2	2·3	0·2	17·0	29·6
Leeds	23 4	51 1	25·8	46·9	54·7	58·2	7·3	6·9	6·7	5·4	7·3	5·3	2·5	0·3	16·8	30·5
Otley and Keighley .	28 5	54 11	25·8	40·1	46·9	51·7	8·7	7·1	5·0	5·3	7·1	7·6	6·5	0·9	14·9	23·2
Skipton, Sedbergh, and Settle.	31 11	55 8	19·9	33.8	41·2	46·3	9·1	6·7	5·8	6·0	8·5	10·2	6·3	1·1	12·9	22·0
Pateley Bridge, Ripon, and Knaresborough.	36 3	60 0	20·1	31·0	38·8	42·6	7·6	5·1	5·8	6·5	9·1	12·8	9·1	1·2	12·8	19·8
Selby, Goole, and Pontefract	29 1	59 4	26·4	42·3	50·9	54·1	6·4	4·2	4·3	5·2	7·4	10·5	6·8	0·9	15·6	24·9
Doncaster and Thorne	32 5	58 2	20·0	34·5	44·1	46·6	6·8	6·5	5·7	5·4	8·6	11·6	6·6	1·2	13·4	23·2
Average . .	25 11	53 6	25·2	43·2	51·0	55·3	7·8	6·3	5·9	5·8	7·1	7·5	3·9	0·4	15·0	25·8
Total Number of Deaths	..	..	6,161	10,580	12,495	13,554	1,903	1,527	1,440	1,425	1,738	1,831	967	107	..	..

		Extreme Districts.	
		Pateley, &c.	Sheffield.
Total Number of Adults prematurely dying	6,295		
,, to every 10,000 of the Population	56	44	67
Number of all Classes dying from Epidemic, Endemic, and Contagious Diseases	4,343		
,, to every 10,000 of the Population	39	23	51
Deaths of all Classes from Diseases of the Respiratory Organs.	6,227		
,, to every 10,000 of the Population	55	34	74

Excess beyond the Loss of Life experienced at Pateley Bridge, Ripon, and Knaresborough, preventible in each District.

REGISTRATION DISTRICTS.	Excess in Number of			Years' Loss of Life to		Total Loss of Money Value of Productive Labour at 10*s.* per Week Men, and 5*s.* per Week Women; say 7*s.* 6*d.* per Week to each Adult Individual.	Total Loss on the Year's Deaths in			
	All Deaths.	Deaths of Adults.	Births.	Every Individual.	Every Adult.		Sickness.	Funerals.	Labour.	Total.
				Yrs. Mnths.	Yrs. Mnths.	£.	£.	£.	£.	£.
Saddleworth, Ecclesfield, Wortley, and Ecclesall Bierlow	331	113	845	10 0	7 2	140	9,268	1,655	145,600	156,523
Sheffield	722	27	1,032	13 9	8 6	166	20,216	3,610	148,404	172,230
Rotherham	59	26	188	7 10	5 6	107	1,652	295	28,569	30,516
Wakefield	160	50	406	5 8	7 1	138	4,480	800	71,070	76,350
Huddersfield	219	63	1,018	9 0	7 7	148	6,132	1,095	152,292	159,519
Dewsbury	157	112	775	12 9	8 0	156	4,396	785	79,092	84,273
Halifax	266	96	856	9 5	6 3	122	7,448	1,330	22,352	31,130
Bradford	696	271	1,541	16 0	9 5	184	19,488	3,480	197,800	220,768
Leeds	1,169	104	2,011	12 11	8 11	174	32,732	5,845	317,028	355,605
Otley and Keighley	73	68	313	7 10	5 1	99	2,044	365	57,123	59,532
Skipton, Sedbergh, and Settle	107	25	138	4 4	4 4	64	2,996	535	32,704	36,235
Selby, Goole, and Pontefract	181	44	451	7 2	0 8	13	5,068	905	7,644	13,617
Doncaster and Thorne	194	59	279	3 10	1 10	36	5,432	970	19,620	26,022
Total	4,334	528	9,853	..	..	..	121,352	21,670	1,279,298	1,422,320
Average	..	..	..	10 9	6 10	133	..	..	..	..

REGISTRATION DISTRICTS.	Average Age at Death of all who Died.	Average Age at Death of all who Died above 20	Proportion per Cent. of Deaths to Total Deaths												Proportion per Cent. of Deaths to Births.	
			Under				Between							90 and upwards	Under	
			1 Year.	5 Years.	15 Years	20 Years.	20–30	30–40	40–50	50–60	60–70	70–80	80–90		1 Year.	5 Years.
	Yrs. Mths.	Yrs. Mths.														
Howden and Skirlaugh .	31 6	57 2	23·3	35·3	44·4	48·6	8·6	6·2	5·0	5·4	6·8	11·4	7·0	1·0	15·1	22·9
Hull	28 0	54 5	24·6	42·8	48·8	51·2	7·0	6·8	7·2	5·6	8·7	9·5	3·2	0·7	26·7	46·4
Sculcoates	25 11	55 10	28·2	46·5	54·2	56·3	7·6	6·0	4·1	3·8	8·0	9·1	4·5	0·6	20·0	33·0
Patrington, Beverley, Driffield, and Bridlington.	28 0	56 7	23·6	41·8	50·3	54·1	7·5	5·5	4·1	5·6	8·1	8·8	5·4	0·9	17·6	31·1
Pocklington and Tadcaster	35 2	59 3	19·9	32·6	39·0	43·6	8·2	6·4	5·0	5·7	7·3	14·0	8·7	1·1	12·7	20·8
York	35 9	56 9	22·9	31·3	36·3	39·2	7·3	7·9	7·9	7·5	10·8	11·3	7·3	0·8	17·3	23·5
Average .	30 2	56 5	25·8	39·2	46·2	49·5	7·5	6·4	5·6	5·6	8·5	10·3	5·6	0·8	18·4	30·1
Total number of Deaths	..	..	1,363	2,226	2,625	2,809	428	366	320	321	483	583	320	46	..	..

		Extreme Districts.	
		Pocklington.	Hull.
Total Number of Adults prematurely dying	1,435		
,, ,, to every 10,000 of the Population	60	47	78
Number of all Classes dying from Epidemic, Endemic, and Contagious Diseases .	1,155		
,, to every 10,000 of the Population	48	34	57
Deaths of all Classes from diseases of the Respiratory Organs	1,193		
,, to every 10,000 of the Population	50	43	67

Excess beyond the Loss of Life experienced at Pocklington and Tadcaster preventible in each District.

REGISTRATION DISTRICTS.	Excess in Number of			Years' loss of Life to		Total Loss of Money Value of Productive Labour, at 10*s.* per week Men, and 5*s.* per week Women; say 7*s.* 6*d.* to each Adult Individual.	Total Loss on the Years' Deaths in			
	All Deaths.	Deaths of Adults.	Births.	Every Individual.	Every Adult.		Sickness.	Funerals.	Labour.	Total.
				Yrs. Mths.	Yrs. Mths.	£.	£.	£.	£.	£.
Howden and Skirlaugh	56	7	78	3 8	2 1	41	1,568	280	10,209	12,057
Hull	449	161	84	7 2	4 10	94	12,572	2,245	55,272	70,089
Sculcoates	270	33	227	9 3	3 5	67	7,560	1,350	27,403	36,313
Patrington, Beverley, Driffield, and Bridlington	308	30	181	7 2	2 8	52	8,624	1,540	32,604	42,768
York	160	135	3	..	2 6	49	4,480	800	30,919	36,199
Total	1,243	366	455	..	..	..	34,804	6,215	156,407	197,426
Average	..	..	..	5 7	3 2	62	..	..	..	..

REGISTRATION DISTRICTS.	Average Age at Death of all who Died.	Average Age at Death of all who Died above 20	Proportion per Cent. of Deaths to Total Deaths.												Proportion per Cent. of Deaths to Births.	
			Under				Between							90 and upwards	Under	
			1 Year.	5 Years.	15 Years.	20 Years.	20–30	30–40	40–50	50–60	60–70	70–80	80–90		1 Year	5 Years.
	Yrs. Mths.	Yrs. Mths.														
Easingwold, Malton, Helmsley, and Pickering	37 9	57 0	18·2	28·6	35·5	38·2	9·3	6·2	5·3	6·6	11·3	12·8	8·9	1·4	10·3	16·1
Scarborough	37 4	57 8	18·5	28·5	31·8	38·1	7·0	7·5	7·0	9·1	10·3	12·9	6·8	1·4	11·6	17·9
Whitby, Guisborough, and Stokesley . . .	42 1	61 7	17·2	25·9	30·5	33·6	6·4	7·3	6·0	7·1	11·3	13·8	12·2	2·2	10·1	15·2
Northallerton, Thirsk, Leyburn, Richmond, Askrigg, Reeth, and Bedale	39 0	60 4	16·3	27·0	34·5	38·1	9·0	5·2	5·5	7·3	9·1	12·7	10·6	2·3	9·9	16·5
Average .	39 1	59 10	17·3	27·4	33·9	37·2	8·3	6·2	5·8	7·3	10·4	13·0	10·0	1·9	10·3	16·8
Total Number of Deaths	..	..	592	938	1,159	1,273	283	213	197	250	355	445	341	66	..	..

		Extreme Districts.	
		Whitby.	Scarborough.
Total Number of Adults prematurely dying	943	192	131
,, ,, to every 10,000 of the Population	51	48	61
Number of all Classes dying from Epidemic, Endemic, and Contagious Diseases .	438	63	50
,, to every 10,000 of the Population	24	16	23
Deaths of all Classes from Diseases of the Respiratory Organs	717	158	75
,, to every 10,000 of the Population	38	40	35

Excess beyond the Loss of Life experienced at Whitby, Gainsborough, and Stokesley, preventible in each District.

REGISTRATION DISTRICTS.	Excess in Number of			Years' Loss of Life to		Total Loss of Money Value of Productive Labour, at 10*s.* per week Men, and 5*s.* per week Women; say 7*s.* 6*d.* to each Adult Individual.	Total Loss on the Years' Deaths in			
	All Deaths.	Deaths of Adults.	Births.	Every Individual.	Every Adult.		Sickness.	Funerals.	Labour.	Total.
				Yrs. Mnths.	Yrs. Mnths.	£.	£.	£.	£.	£.
Easingwold, Malton, Helmsley, and Pickering	..	47*	70	4 4	4 7	89	..	..	55,002	55,002
Scarborough	44	10	33	4 9	3 11	76	1,232	220	20,140	21,592
Northallerton, Thirsk, Leyburn, Richmond, Ascrigg, Reeth, and Bedale .	26	42*	45*	3 1	1 3	24	728	130	19,008	19,866
Total	70	79*	58*	..	..	..	1,960	350	94,150	94,460
Average	..	..	..	3 9	2 3	44	..	..	..	..

* Diminution.

On the Application of Sewer-Water to the purposes of Agriculture, with a view to the establishment of an independent Income for the Improvement of Towns.

By James Smith, Esq., of Deanston.

The greatest obstruction to the improvement of towns, as regards their sanatory condition, is the difficulty of finding money to accomplish the necessary works. The only existing mode of raising money for such purpose is by a rate upon the inhabitants: rates are, under any circumstances, unpopular; and more especially so when made for a purpose the advantages of which are not generally understood, or which do not come at once as an appreciable advantage to each individual. The popular feeling against rates has a constant tendency to obstruct improvement. If, therefore, a source can be found from which a sufficient supply of money can be obtained for carrying out, in the most complete manner, all the necessary works for promoting the health and comfort of the people altogether independent of rates, one of the greatest boons to large towns, and, indeed, to all towns, will have been accomplished. I shall, with that view, endeavour to show, that in the profitable application of the sewer-water of every town, there is that source of independent income so much to be desired.

In the sewer-water of all towns, whether running upon the surface in open channels, or finding its way to the nearest brook or river in covered conduits, there must be a large amount of the *débris* of the great mass of matter, which is constantly being carried from the country, to sustain as well the inhabitants as the various animals kept in every town; and this *débris*, being of animal and vegetable origin, must be well fitted to be applied to the land as a manure: reasoning with very ordinary intelligence would at once lead to this general conclusion; but, by the aid of chemical science employed in conjunction with the physiological discoveries of late so clearly laid before the world by Liebig, Boussingault, Sprengel, Johnston, and others, we are enabled to ascertain the particular amount, and to appreciate the pecuniary value of such manure. Independent, however, of scientific inquiry, we have some important practical examples of the great value of sewer-water applied as a manure.

The sewer-water of some sections of the city of Edinburgh has been applied, for upwards of 30 years, in irrigating land of various qualities, for the purpose of promoting the growth of grass, which is cut and used as house-food for horses and cattle, consisting chiefly of milk cows. The sewer-water coming from a section of the Old Town, is discharged into a natural channel or brook, at the base of the sloping site of the town, at sufficient height above a large tract of ground extending towards the sea to admit of its being flowed by gravitation over a surface of several hundred acres. The water, as it comes from the sewers, is received into ponds, where it is allowed to settle and deposit the gross and less buoyant matter which is carried along by the water whilst it flows on a steep descent. From these tanks or settling ponds the sewer-water flows off at the surface, at the opposite end to its entrance. The water so flowing off still holds in suspension a large quantity of light flocculent matter, together with the more minute *débris* of the various matters falling into the sewers, and chiefly of vegetable

and animal origin. The water is made to flow over plats or plateaus of ground, formed of even surface, so that the water shall flow as equally as possible over the whole, with various declinations, according to circumstances; and it is found in practice, that the flow of water can easily be adjusted to suit the declination. The land nearest the source is generally a strong loam, on a clay subsoil: as the land extends towards the sea the soil becomes lighter, until at the beach, where it is altogether a pure sea sand, without any appreciable amount of earthy matter. This sand, in its original state, carried but a few scattered patches of stunted whins, intermixed with bent grass. When the irrigation of the sewer-water was first applied to the land nearest to Edinburgh, it was simply allowed to run over the surface in the usual mode of irrigation; but, after the introduction of thorough draining, the beneficial effects of such drainage on arrable land and pasture, suggested to the late Mr. Oliver, of Lochend, one of the tenants of the irrigated meadows, the propriety of having under-drainage in the irrigated ground; and he found, as he had anticipated, great advantage from it, as it permitted the water to percolate through the soil to a considerable depth, thereby diffusing its enriching ingredients through the whole body of the active soil, and even into the subsoil. Thus at present a great proportion of the water thrown upon the land passes through the soil by filtration, whilst only a part now flows off from the surface. As the water flows from each successive plat it is received into an open channel, whereby it is conducted to a succeeding plat, at a lower level, until having passed over a great number, it reaches the sea, and is then lost, though still rich in fertilizing matter, as the following analyses of water, taken from the different stages of its progress, will abundantly show.

Analyses made by Mr. Phillips, the Government chemist, at the Museum of Economic Geology, namely:—

No. 1. Water taken up immediately on its leaving the sewer.
No. 2. Taken as it flowed from the subsidence pond.
No. 3. Taken after having flowed over one plat.
No. 4. Taken after having flowed over several plats.
No. 5. Taken still further on.
No. 6. Taken at the sea.

The analyses stand thus:—

	Solid Matter, in Suspension.	Solid Matter, in Solution.	Sulphuretted Hydrogen Gas.
The gallon of No. 1 gave	244 grains.	82·7 grains.	20·4 cubic inches.
,, 2 ,,	52 ,,	87 ,,	10·4 ,,
,, 3 ,,	31 ,,	89 ,,	11·8 ,,
,, 4 ,,	15 ,,	82·7 ,,	9·2 ,,
,, 5 ,,	2½ ,,	67·2 ,,	11·4 ,,
,, 6 ,,	2½ ,,	72·9 ,,	1·1 ,,

From these analyses it will, in the first place, be observed, that a large deposit of the matter held in suspension takes place in the pond, and that there is also in the first plat of ground a similar deposit of considerable amount; but, as the water advances, passing over successive

plats, the deposit diminishes, until there is eventually little left in suspension. On looking to the column in which the matter held in solution is given, it will be found that the proportion of the fertilizing matter in solution rather increases after the first application, and is sustained with very little diminution to the end. The reason of this is obvious: the matter being in solution can only be left in the soil in association with a corresponding portion of water; the other water not absorbed passing off with its own portion of matter still in solution. The matter in suspension in the portion of water taken for analysis differs in some degree from the deposit made on the large scale in the pond, for in the latter there would be a proportion of large pieces of various substances not sufficiently disintegrated to be suspended, but which are rolled along on the bottom of the channel by the force of the stream. The matter which is deposited in the ponds is found to be of comparatively little value, being composed chiefly of cinders and other undecomposable substances. The matter of deposit thus obtained does not sell for more than 1*s.* per ton, and its value, when compared with the results of the irrigation by the water which has left, is not more than one-tenth of the value of the latter. I may here remark that I observed on going over the meadows so irrigated with the sewer-water, that the offensive smells complained of by some of the neighbouring inhabitants as arising from the meadows, emanated mainly from the masses of decomposing matter left in the ponds, and not so much, if at all, from the water holding only fertilizing matter in solution.*

The practical result of this application of sewer-water is, that land which let formerly at from 40*s.* to 6*l.* per Scotch acre, is now let annually at from 30*l.* to 40*l.*, and that poor sandy land on the sea shore, which might be worth 2*s.* 6*d.* per acre, lets at an annual rent of from 15*l.* to 20*l.* That which is nearest the city brings the higher rent chiefly, because it is near and more accessible to the points where the grass is consumed, but also partly from the better natural quality of the land. The average value of the land, irrespective of the sewer-water application, may be taken at 3*l.* per imperial acre, and the average rent of the irrigated land at 30*l.*, making a difference of 27*l.*; but 2*l.* may be deducted as the cost of management, leaving 25*l.* per acre of clear annual income due to the sewer-water.

In making an application of the whole sewer-water of a town, so great a proportionate annual income could not be obtained as has resulted from the application of small portions, as the difficulty and expense of conveying it to a distance would require a greater expenditure of money in the apparatus necessary to accomplish that object, whilst the value of the produce resulting from the application would be diminished by its greater distance from the locality of consumption. A demand for grass grown by the application of sewer-water in irrigation has a limit which would compel the application of the greater portion to the enrichment of tillage lands, the results of which have not hitherto been found so profitable as those from grass lands. The water could not well be distributed over the open tillage land by irrigation; it would therefore be necessary to resort to some mode of distributing it

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* Mr. Chadwick and Dr. Arnott, when they went over the irrigated meadows, I am informed, made the same observation.

by jet. This requires the conveyance of the water in pipes, under a pressure of from 100 to 150 feet of altitude, to a number of convenient points in the different farms where it is to be used. In this there is no difficulty; it is a simple engineering question, the success of which is certain, whilst the cost can be estimated on known data. I made an experiment, on a large scale, at the Southwark Water Works, which satisfied me of the practicability of distribution by the jet. With an altitudinal pressure of 120 feet of water, and using a $2\frac{1}{2}$-inch hose with a discharging orifice or nozzle of 1 inch in diameter, I found that I could, from one point, distribute water over an area of two statute acres —but, to be safe, say one statute acre. Dividing the quantity so required annually into three portions, for separate applications, one jet of 1 inch orifice will deliver each portion in about an hour, as ascertained from data founded on an experiment made the same day to ascertain the quantity of water discharged in a given time from a similar orifice, with a similar pressure.

The sites of most towns, or, at all events, the points of discharge of the sewer-water, being at a lower level than the surrounding country, it will in most situations be necessary to pump the sewer-water to altitudes corresponding to the different altitudes of the lands to be supplied, and with an aditional altitude of from 100 to 150 feet, for the purpose of affording the necessary force of jet. This can easily be accomplished by proper pumping engines, and at one or more lifts, as may be found necessary.* The cost of pumping is matter of calculation, depending in some degree on the cost of fuel when water-power cannot be obtained. The extreme cheapness of the cost of pumping water has been given in the evidence before the Commission; but, in order to found the estimate entirely upon practical result, I have taken the data from a result of three years' actual working, kindly furnished by Mr. Bull, of the Calder and Hebble Navigation, from the returns of an engine pumping water from the brook near Halifax to supply the canal; and I take these data with the more confidence, because the water so pumped consisted chiefly of the sewer-water of the town of Halifax. The engines being old, are not of the most improved construction for pumping, and the assumed quantity to be pumped is taken under the quantity which the engines, in Mr. Bull's opinion, can accomplish. I assume 200 feet as an average altitude. A great proportion of the

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* An erroneous notion has gone out relative to the stand-pipe for giving the altitudinal pressure for the jet. In my first public announcement of the jet plan for distributing liquid manure, I used the expression, "tower, with a cistern at the top," as I thought that expression would best convey a notion of the erection necessary to the gentlemen and farmers who heard me; but I find that some have apprehended a large and boardly tower, with a cistern of considerable dimensions, like a great tank, at the top. Now, all that is necessary is a double stand-pipe of cast iron, of the same diameter as the main pipe standing near the site of the engine, to the necessary altitude, say to 120 or 150 feet, and which pipe may be steadied and supported from the engine chimney. The pipe will be at the top thus: up the one branch flows the water from the pump, and which, passing down the other, flows off by the main to the service-pipes. The water having to pass over the turn at the top of the stand-pipe, the pressure will be kept up at all times whilst the engine is at work, and it must always be at work when water is being used.

water of most towns can be disposed of at from 50 to 100 feet, and will seldom be required to be raised more than 400 feet. Part of the altitude will be necessarily expended in overcoming the friction of the conveyance pipes, which will, of course, increase with the distance. In making the following estimate, I have confined the district to be supplied to an area of four square miles, containing 2560 statute acres. I have supposed the whole to be laid off in 10-acre fields, and have put down the position for the service-pipes in such order as to effect the distribution of the water over each area of 40 acres by a hose-pipe 312 yards long. The main piping I have assumed at the length of the side of the square, with one mile added to clear the suburbs of the town. The main is taken at 12 inches in diameter, which will be sufficient to pass the quantity of water required for a great extent of land; and the service-pipes are taken at 4 inches diameter, which is very ample, as never more than two or three jets will be playing from one service-pipe at the same time. The main-pipes I have estimated as of cast-iron, the service-pipes as of fire clay, as I have ascertained that such can be had at one-third of the price of cast-iron pipes, and I have seen such proved to a pressure of 600 feet. They will certainly stand well a pressure of 300 feet. These pipes I suppose to be sunk two feet under the surface, with a plug-opening for attaching the hose for each four fields or 40 acres. The hose-pipe and jet must in all cases be worked by persons employed by the sewer-water establishment, who will apply the liquid at such times, in such manner, and in such quantity as the farmer shall desire, under proper regulations. Part may be delivered by jet, part for purposes of irrigation; and it is evident that any farmer would be greatly benefited by appropriating a portion of his farm as meadow, to be irrigated by the sewer-water for the production of early and abundant crops of grass. The application to the tillage land could be made at any time, on bare fallow or on growing crops; and it is probable that two or more applications in the course of the season, of limited quantities, would be found most conducive to the luxuriant and perfect growth of the crops. Experience will in due time point out the best modes of application. The quantities to be given I have assumed from an analysis showing the amount of fertilizing matter in the sewer-water of Edinburgh and Leeds, as analysed, the former by Mr. Phillips, and the latter by Mr. West, of Leeds; and, making an approximate comparison with guano of the best quality, assuming 2½ cwt. of guano to be equal to 5 cwt. of the fertilizing matter of sewer-water. 2½ cwt. of guano, applied annually to an acre of land, would induce a very rich condition of the soil, especially when conjoined with the farm-yard manure always available, and would even tend, in a course of years, to increase very much the amount of this description of manure. Taking the quantity of water necessary, from analyses, to furnish 5 cwt. of fertilizing matter, at 17,920 gallons per acre, I give below an estimate of the cost thereof; I give also an estimate of the cost of supplying double that quantity, equal to 5 cwt. per acre of guano, or 30 tons of farm-yard manure.*

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* By an experiment made last season, on a portion of meadow in Lancashire, applying at the rate of 15 tons of farm-yard manure per acre, and 3 cwt. of guano to another equal portion, their effects were found to be inferior to the 8 tons of sewer-

ESTIMATE of the probable Expense of Receiving-Tanks, Pumping-Engine, Pipes, Hose, &c., for raising, conveying, and distributing Sewer-Water over an area of Four Square Miles (equal to 2560 acres).

	£.	s.	d.
Receiving-tanks or ponds.	500	0	0
30-horse pumping-engine, engine-house, chimney, &c.	2,000	0	0
*Three miles of 12-inch main-pipe	3,704	0	0
Sixteen miles of fire-clay service-pipes . . .	2,020	6	4
Hose with screw joints	283	4	0
Plug-cocks	128	0	0
	8,635	10	4
Contingencies, 10 per cent. . .	863	11	2
Outlay for 2,560 acres. . . .	£9,499	1	6

For one acre, 3*l.* 14*s.* 2*d.*

ESTIMATE of the probable Annual Expense of the Application of 17,920 gallons of Sewer-Water per Acre, which will contain 5 cwts. of dissolved and suspended matter, and which is considered to be equal to a dressing with 2½ cwt. of guano, or 15 tons of farm-yard manure.

	£.	s.	d.
Raising 45,875,200 gallons 200 feet high, to be distributed over 2,560 acres, allowing 17,920 gallons per acre, at 2*d.* per 2,400 gallons . .	159	15	1
Annual wear of hose	93	12	0
Management, and wages of men employed in distributing	348	0	0
Rates and taxes	320	0	0
Interest on sunk capital 9,499*l.* 1*s.* 6*d.*, at 5 per cent.	474	19	0
Allow for repairs and sinking-fund 2½ per cent. on outlay	237	9	6
Annual expense of application to 2,560 acres . .	1,633	15	7

	£.	s.	d.
Cost of manuring one acre with sewer-water . .	0	12	9
,, ,, guano, 2½ cwt., at 8*s.*	1	0	0
,, ,, farm-yard manure, 15 tons, at 4*s.*	3	0	0
Sewer-water is cheaper than guano	0	7	3
,, ,, farm-yard manure .	2	7	3
,, ,, the average of the two	1	7	3

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water applied to a similar extent of ground. The water applied not having been analysed, I cannot estimate the amount of fertilizing matters contained in it; but assuming a similar quantity to that found in the Edinburgh sewer-water, the amount applied must have been about 1792 gallons per acre, which is much less than the quantity I proposed to apply to tillage land.

* One-half of the cost of the main-pipe is only charged, as from its position and capacity it is sufficient to supply other sections of land of equal extent.

ESTIMATE of the probable Annual expense of the application of 35,840 gallons of Sewer-Water per acre, which will contain 10 cwt. of fertilizing matter, and which is considered equal to a dressing with 5 cwt. of guano, or 30 tons of farm-yard manure.

	£.	*s.*	*d.*
Raising 91,750,400 gallons of sewer-water, to be applied to 2,560 acres, at 2*d.* per 2,400 gallons	319	10	2
Annual wear of hose	140	8	0
Management and wages of men employed in distributing	396	0	0
Rates and taxes	500	0	0
Interest on sunk capital at 5 per cent.	474	19	0
Repairs and sinking-fund, 3 per cent. on outlay	284	19	6
Annual expense of the application to 2,560 acres	£2,115	16	8

	£.	*s.*	*d.*
Cost of manuring one acre with sewer-water	0	16	6
,, with guano, 5 cwt. at 8*s.*	2	0	0
,, with farm-yard manure, 30 tons at 4*s.*	6	0	0
Sewer-water is cheaper than guano	1	3	6
,, ,, farm-yard manure	5.	3	6
,, ,, the average of the two	3	3	6

I have ascertained that the quantity of sewer-water due to a town of 50,000 inhabitants amounts to about 1,190,080,946 gallons per annum, which quantity will yield an annual application of 17,920 gallons per acre to an extent of 66,410 acres. Taking the average cost of guano and farm-yard manure, as shown in the first and lowest estimate, at 2*l.* per acre, and deducting 12*s.* 9*d.*, the cost of the application of the sewer-water, there will appear a saving due to the sewer-water of 1*l.* 7*s.* 3*d.* per acre; allowing one-half thereof to go to the farmer, there will remain a free income due to the sewer-water of 45,241*l.*, which is nearly one pound per head of the population.

This result is so far corroborated by the estimates given by Liebig, and other chemists, of the value of the solid and liquid excreta of a man. But here there is, in addition in the sewer-water, a vast amount of soap-suds, dish-washings, horse and cow urine, the *débris* from manufactures, the washings of the streets, &c. At present in most towns much of the human excreta, both solid and liquid, passes off into dung-pits, &c.; but a more perfect system of sewerage would secure the whole of the liquid and dissolvable *débris* made within the town so as to cause a much greater enrichment of the sewer-water than exists at present anywhere, or than was found in the sewer-water analyzed to afford data for this estimate.

Taking a general view of the subject, we may safely assume a clear revenue from the sewer-water of all towns of 1*l.* for each inhabitant, either in a direct money return, or partly to the inhabitants in a reduced price from the increased abundance of produce: and it is obvious that such income annually accruing will provide a sufficient fund for the improvement of all towns in a manner corresponding to the most en-

lightened views with respect to sanatory regulation and improvement of the present time, and will remain as a source for accomplishing such further improvements as science and practical experience shall from time to time suggest.

Obstacles, both moral and physical, will no doubt be found in the way, but none certainly more formidable than such as were opposed to the introduction of gas for lighting towns. At present the sewer-water of towns is unappropriated, and, although all contribute to its production, none claim therein a right of property. It is in principle and in origin public property, and, having an important value, it becomes the duty of the guardians of the public interests to take steps, in the first place, for the investment of all sewer-water for the public interest, and thereafter to provide legal facilities for rendering it practically available. Some time will elapse before the public in general see and fully appreciate the merits of this scheme, and no great heed will be given to it, until at least one town, or section of a town, shall have put the plan into actual operation ;* but so soon as that shall have been accomplished there will be a general desire to adopt the plan, and there will be no difficulty in finding ample capital for the purpose. The great outlets of the sewerage of most towns can with little difficulty be adapted to the appropriation of the sewer-water for agricultural purposes, and the internal and more minute sewerage can afterwards be carried to comparative perfection by the funds which will arise from such appropriation.

With such command of funds as the application of the sewer-water will afford, the structural improvement of towns will proceed with a steady progress unfettered by private interests, and uninfluenced by popular clamour.

COPY of a COMMISSION issued in the Reign of HENRY the FOURTH, for INQUIRING into the MEANS of DRAINING and SUPPLYING the TOWN of KINGSTON-UPON-HULL with WATER. *Inquisition ad quod Damnum.* 3 Hen. IV.

HENRY, by the grace of God, King of England and France, and Lord of Ireland, to our chosen and faithful Henry de Percy le Fitz, Esquire; William Gascoigne, Esquire; Peter de Bukton, Esquire; John Scrop, Esquire; Robert de Hilton, Esquire; John Rouche, Esquire; John Holtrum, Esquire; Robert Tirwhit, William Lodyngton, Hugh Arderne, John de Predenesse, and Richard Tirwhit, greeting: Know ye that whereas, as we have learned, our chosen lieges the mayor, bailiffs, and commonalty of our town of Kingston-upon-Hull, hold the same town of us at a fee farm of sixty and ten pounds per annum, and that town is situated upon the river Humber, which is an arm of the sea: and there is need in these days of great charges and expenses for the protection of the same against the force of the water aforesaid: and so as well on account of charges and expenses of this kind there daily arising, to be sustained and supported, as that sweet water is not had coming or

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* I am at present engaged by the Harbour Commissioners of Aberdeen to report upon the best means of applying the sewer-water of that city for agricultural purposes.

flowing to that town, except only by boats, and that at sumptuous cost, whereby the poor inhabitants of the town aforesaid in large numbers every year during the summer time, of necessity, on account of the scarcity and dearness of water of this kind, depart from the same town and renounce and avoid it, to the injury of the town aforesaid, and in process of time to the final destruction of the same, unless a suitable and speedy remedy in this matter be speedily applied. We, considering the aforesaid, and that the said town is the key of the country there adjacent, and of all the county of York, and desiring therefore to treat with gracious favour the aforesaid mayor, bailiffs, and commonalty in this matter, at the petition of the mayor, bailiffs, and commonalty themselves, have assigned you, eleven, ten, nine, eight, seven, six, five, four, and three of you, of whom we desire some one of you (you the aforesaid Henry, William, Robert Tirwhit, William and Hugh, to be one) to inform yourselves by all legitimate and honest ways and means by which, according to your sound discretions you shall best have known how or be able, and also to make inquiry if it shall be necessary, upon the oath of good and lawful men of the county aforesaid, as well within as without the liberties, through whom the truth of the matter shall be able to be ascertained, how and in what manner the said town the better, the more speedily, and the more effectually shall be able to be relieved and sustained with sweet water of this kind, through parts there contiguous and adjacent, as well by sewer courses as by other mode; and to the full and due execution of all and of each (of the things) which shall happen to be devised in this matter, through information of this sort, or by inquiries, by you eleven, ten, nine, eight, seven, six, five, four, or three of you (of whom we desire some one of you, you the aforesaid William, Robert Tirwhit, William and Hugh, to be one) to be duly taken to be ordered, made and completed in the best and most discreet manner which you shall know or be able. And further to inquire by the oath of good and lawful men of the same county, as well within as without the liberties through whom the truth of the matter shall be better able to be known, whether the aforesaid matter to be ordered, made, and completed in this business, by you eleven, ten, nine, eight, seven, six, five, four, and three of you (of whom we desire some one of you, you the aforesaid Henry, William, Robert Tirwhit, William and Hugh, to be one) when they shall have been so ordered, made, and completed, be to our loss or prejudice, or (to the loss or prejudice) of others, or not; and if it be so, then what our loss and what our damage, and to what the loss and what the damage of others, and of whom, and how, and in what manner. And therefore we command you that at certain days and places which you eleven, ten, nine, eight, seven, six, five, four, or three of you (of whom, we desire some one of you, you the aforesaid Henry, William, Robert Tirwhit, William and Hugh, to be one) shall have provided for this purpose, you diligently attend respecting the aforesaid matters, and cause them to be inquired into, and examine them, and send without delay to us in our Court of Chancery, and this briefly, the inquisitions thence distinctly and openly made under the seals of you eleven, ten, nine, eight, seven, six, five, four, or three of you the aforesaid (of whom we desire some one of you, you the aforesaid Henry William, Robert Tirwhit, William and Hugh, to be one) and under the seals of these, through whom they shall have been made. For we

have commanded our sheriff of the county aforesaid, at certain days and places, which you eleven, ten, nine, eight, seven, six, five, four, or three of you (of whom we desire some one of you, you the aforesaid Henry, William, Robert Tirwhit, William and Hugh, to be one) may cause him to know, that he cause to come before you eleven, ten, nine, eight, seven, six, five, four, or three of you (of whom we desire some one of you, you the aforesaid Henry, William, Robert Tirwhit, William and Hugh, to be one) so many and such good and lawful men of his bailiewick, as well within as without the liberties, through whom the truth of the business in the aforesaid matters shall be able the better to be known and inquired into. In testimony of which thing we have caused these other letters to be made patent. Witness me myself at Westminster, the Eighth day of March, in the Second year of our Reign.

By the King himself and Council,

GAUNSTEDE.

(Here follows the Return of the Inquisition of the Jury.)

INDORSED.

The Answer of John Scrop, Esquire, and of his Fellow Commissioners within written, appears in an Inquisition and Verdicts.—(Sewed to this Commission.)

WE, John Scrop, Hugh Arden, John Redeves, Richard Tirwhit, and our Associates, Commissioners of the Lord the King, being assigned by his letters patent to arrange, effect, and determine how in what manner the town of Kingston-upon-Hull shall be able to be better more speedily, and effectually relieved and sustained with sweet water, as well by sewer courses as by other mode, according to the force, form, and effect of the said letters to us, the aforesaid Commissioners directed, as in the same letters patent more fully appears; by virtue of which aforesaid letters, indeed, by good deliberation previously had. Also through the information, assent and consent of the parts adjacent, and of very many trustworthy persons, we have, for our decision decreed, ordained, and determined that a certain ditch named a sewer constructed anew in the pasture meadows and ground of Aulaby, in breath 12 feet, and of the depth of 5 feet measured by the royal yard, in length from the spring called Julianswell, in the said pasture meadows and ground of Aulaby, as far as the Waldkerr of Swanland, and so descending from the Waldkerr aforesaid, in the length, breadth, and depth aforesaid, as far as Mitonker dike, and so descending by Mitonker dike, on the north part of the field of Mitonker, as far as a certain ditch newly made near the common road which leads from the aforesaid town of Kingston, towards Beverley, in length descending as far as the ditch called the Town Dike, under the walls of the said town of Kingston, and so thence descending and by sufficient course, as far as the gate of the said town of Kingston-upon-Hull; and that a sufficient dam for the warding off of the salt water, may be made in the north end of a certain ditch lying between the pasture of Aulaby and the pasture of Swanland, called the Waldkerr, for ever; and another sufficient dam likewise made for the warding off of the salt water at the north end of a certain ditch lying between the pasture of Swanland called the Waldkerr, and a certain pasture called Mitonker, together with all other dams whatever hereafter to be made, wherever it shall appear necessary to the mayor,

bailiffs, and commonalty of Kingston-upon-Hull, now and in future, for the preservation of the sweet water aforesaid, and the warding off of all salt waters whatever coming there for ever; and that all the dams aforesaid made or in future to be made there, as well in constructing as in repairing, be made by the aforesaid mayor, bailiffs, and commonalty at their own proper cost, without injury, disturbance, or obstruction of any persons whatever for ever. Through which sewer, indeed so to be newly constructed and afterwards to be called Juliandike, all the courses of the sweet waters as well of the said spring called Julians well as of all other courses of springs in Demynghamynges in Aulaby, together with the course of a certain ditch in Demynghamynges aforesaid, and the Northkerr of Aulaby, together with the courses of two springs existing in Aulaby and Hautempris, namely, from one spring in the ditch formerly (in possession) of Peter de Aulaby in Aulaby, thence descending as far as the aforesaid ditch called Juliandike, and from another spring in the field of Hautempris in the Northwestynges, from thence descending by different courses as far as the aforesaid ditch of Juliandike, may have a direct course in the aforesaid ditch called Juliandike, as is above written of the aforesaid matters, in the support, upholding, and relief of the royal town aforesaid. Moreover, we, the aforesaid Commissioners, according to the tenour, force, form, and effect of the Commission aforesaid, have caused diligent inquiry to be made by means of different inquisitions taken before us, in neighbouring places and parts adjacent, in the presence of tenants making communications on the ground aforesaid, where the ditch aforesaid is ordered to be made, as in the verdicts of the said inquisitions, sealed and stitched to this letter, more fully appears; all which things having been ordered, ordained, determined, and adjudged, and also (as it is said) inquired into by us, the aforesaid Commissioners, the tenants of the ground aforesaid with unanimous assent and consent, have defined and ordained that the aforesaid ditch should be made as well in length and breadth as in depth, according to our order, determination, and decision aforesaid, and the verdict of the inquisition aforesaid. In testimony, indeed, affirmation, and approval of our aforesaid order, determination, and decisions to last for ever, for the improvement of the adjacent county, and the relief and support of the aforesaid royal town, according to the effect of the Commission of the Lord the King, we have affixed our seals to these presents.

Dated the Eighth day of October, in the Third Year of the reign of King Henry the Fourth after the Conquest.

Mr. Joseph Farrar, one of the Secretaries of the Mechanics' Institution, Bradford.

What is your experience of the necessity of provisions for a Building Act, to remedy the evils you have in existence in Bradford?

We should not have had, as we have, instances where streets are built across and stopped up at the ends; of this we have several instances in Bradford. I imagine that the property has been considerably deteriorated, as well as the health of the inhabitants, from that circumstance. Another evil we should have avoided, and the houses would

have been properly drained; I think there ought to be some compulsory powers, for the protection of the tenantry, to have the slop-drains run into the main sewers.

Would the convenience of cheap supplies of water and of water-closets be appreciated by the working classes?

I think the introduction of proper supplies of water into the houses would be appreciated, and would facilitate the improvement of the working classes; but they are not yet generally acquainted with water-closets.

Are there not in Bradford a considerable proportion of married men of improving habits that might adopt any improvements such as those recommended; and if they saw that they were the means of reducing sickness, be willing to pay a little additional for the benefits they would derive from them?

Yes; I think many would, and would voluntarily pay what was necessary.

When the better class of workmen become accustomed to it, would not other inferior classes follow?

I think they would.

Have there been many fires in houses belonging to the working classes?

I think we have had very few fires—only three or four during the last 20 years from tenements of the working classes.

What sort of walls are built for the cottage tenements?

The walls for cottage houses are generally a single brick; in better houses they are thicker. I do not think that in the labouring class tenements it would be necessary to incur the expense of providing party-walls by a legislative Act.

Do many of the labouring classes own houses?

Many of the working classes have built their own cottages: those that have saved perhaps 60*l.* or 70*l.* have purchased land and raised money on mortgages, and then have erected others. In some instances clubs, sustained by monthly payments, have built, and the houses are divided by valuation and lot.

What proportion of labouring class houses are held directly or indirectly by themselves?

I cannot state precisely; probably there might be one-third of the cottage houses owned by the labouring class.

Are there other classes that are wholly dependent on cottage rent?

Yes; I know several who sink all their capital in cottages, and depend on the rent.

It is to be presumed, then, that few could advance money for permanent improvements on the property?

It would on many be a matter of great severity to have any more immediate outlay.

If the money were raised by loan, and payment spread over a period coincident with the benefit—say 20 years—and charged at a rate of 3*s.* or 4*s.* per annum?

It would undoubtedly facilitate the improvement to spread the expenditure over a period of years.

Would it be desirable to enforce better ventilation?

Undoubtedly it would.

Would it receive much opposition?

I think not.

To the Commissioners for Inquiring into the Sanatory Condition of Populous Towns.

Gentlemen, *Bradford, Yorkshire, March 22nd*, 1844.

The Bradford Board of Surveyors beg respectfully to offer to you their opinions of what they deem to be the defects in the General Highway Act, and also to point out to you some of the local difficulties they have to contend with in the discharge of their duty.

The present Board of Surveyors, consisting of 13 members, was formed 12 months ago under the 18th section of the Highway Act, previous to which time there were only two surveyors for the whole township. A party of rate-payers alive to the importance of having better regulations in the town, assembled at the vestry and elected the present Board, several of whom have taken a great interest in the good management of the town. The surveyors have divided the town into districts or wards, over each of which two members of the Board are appointed to superintend. They have let the collection of the rate on the per centage system, and have made several other arrangements with the view of carrying out the improvements required in the most efficient and at the same time in the most economical way. Several improvements have already been effected; some are in progress, and others in contemplation. Nevertheless, by the present constitution of the Board, the whole of the surveyors will have to retire from office at the end of the year, and though re-eligible, they are aware that at the ensueing election a stronger party may assemble and elect an entire new Board, who may be either totally ignorant of their duties, or who, being averse to the plans of the present Board, may suspend the improvements now going on, and prevent those that are in contemplation. From the loose wording of the Act, also, it is not clear whether, when a Board is once formed, the vestry shall have power to revert to the old mode of management. To remedy these evils the surveyors think that only a portion of the members of the Board should retire annually. They also think that the election should not be by the vestry, but that they should be elected by the burgesses on the burgess list in corporate towns, or in the same manner and at the same time as the Poor Law Guardians in towns where there is not a corporation. They wish also to remark, that the present Act makes no provision for supplying vacancies in case of the death of any of the surveyors. During the past year two active and efficient members of the Board have died, and for want of such a provision, no others could be appointed in their room.

The Highway Act does not clearly define the powers which the Board of Surveyors have in the appointment or the discharge of some officers, or in the recovery of moneys, books, documents, &c., from any of the officers who may be disposed to retain them. An instance has occurred during the present year when a collector, on being discharged, took away from the office all the rate-books and kept them nearly a month, during which time the business of collecting was at a stand. The magistrates refused to interfere till the Special Highway Sessions were held; and the remedies are so imperfectly defined in the Act, that the Board were doubtful whether they should succeed when the case should be heard. The collector, however, was prevailed on to

give up the books after the proceedings had commenced. The surveyors think that the law for such cases ought to be more clearly defined, and that not only for such cases, but for the general purposes of the Act, it should be more summary.

The fees payable to the clerk of the magistrates, according to the 10th section of the Highway Act, are, in the opinion of the surveyors, much too high, and are considered very oppressive to the poorer classes. The cost of a summons is 2*s*., and for a distress warrant 4*s*. Now there are several thousand rate-payers in Bradford whose rates do not amount to more than 2*s*., and when the rate is small, the surveyors are reluctant to summon for fear of the expense. In consequence of this, in such a fluctuating population as that of Bradford, a great many of the rates are lost by the removal of the occupiers before proceedings are commenced. They think that if the fees were less they should be induced to summon more readily when a rate-payer was neglecting to pay, and the rate-payers being aware of this, would become more punctual in their payments. They are of opinion, however, that if the owners of property should pay the rates, or at least the rates of all the property the rent of which is under 10*l*., this evil would be remedied. If a poor person wishes to be excused the payment of his rate by the 32nd section of the Act, he is to summon the surveyor before the magistrates, who, upon hearing the case, have power to excuse the rate. This is the only mode pointed out by the Act, by which a poor person can be excused from the payment of his rate. Thus if a rate-payer owes 1*s*., and wishes to be excused, he must summon the surveyors before the magistrates at a cost of 2*s*.; or the surveyors must summon the rate-payer at the same cost, and then the magistrates may forgive the rate. To remedy this the surveyors think that the Board should have power to excuse the rate of any poor person without the interference of the magistrates at all; or the magistrates might, on the recommendation of the Board, be empowered to excuse such rates.

Local Difficulties.—The Local Act for lighting and watching the town gives the Commissioners, appointed under the Act, power over the causeways and footpaths in such streets as are declared to be within the limits of the Act. The 112th section of the General Highway Act reserves to the Commissioners this power. The effect of these clauses in the respective Acts is this, that a part of the causeways and footpaths are under the control of the Commissioners, and a part of them under the surveyors. From a want of proper official documents, doubts arise frequently as to which of the two bodies certain parts of the causeway belong. From these clauses another evil has also arisen. Either from the remissness of the Commissioners, or from some defect in the Act, encroachments have been frequently made upon the causeways, and a notion has become prevalent that the causeways are the private property of the owners of the houses. This notion is strengthened by the fact that the owners are compelled to keep the causeways in repair by a clause in the Local Act. Hence posts or railways are put down to preserve what they conceive their rights, and which are a source of great annoyance and danger to the public. In consequence of this the surveyors find great difficulty in widening the cartway, in rounding the causeways at the corners of the streets, or in laying down or removing causeways to meet the growing requirement of the town. When any

such alteration is required, they have first to prevail upon the Commissioners to move in the business; and when they undertake any alteration, the owner of the property adjoining not unfrequently resists them, and thus the town is kept in constant turmoil and litigation. About four months ago the Commissioners commenced an alteration in the causeway of one of the principal streets over which the public had passed during the memory of the oldest inhabitant. Nevertheless the owners of the property adjoining drove off the workmen by main force, and the causeway has remained all the winter in an unfinished state, highly dangerous to the public. To remedy this state of things, the surveyors think that the whole of the street from wall to wall ought to be under the control of the same body, and that the expense of the making and the repairing of the cartways and causeways should be defrayed by the public from the Highway Rate.

The Bradford Canal is supplied with water from the Beck, which for a short distance runs parallel to it. The bed of the Beck is lower than the bed of the Canal, and hence flood-gates or stop-gates are put down in the Beck, which prevent the escape of the water till it rises to a certain level, in order that the Canal may have a supply of water, which is conveyed through a sluice for this purpose. The drains of the town are emptied into this watercourse, and principally above the flood-gates. Besides, on the sides of the stream, there are a great many factories of various kinds of manufacture, &c., the soil, refuse, and filth of which fall into the Beck. In summer time the water is low, and all this filth accumulates for weeks or months above the flood-gates, and emits a most offensive smell. This noxious compound is conveyed through the sluice into the Canal, where it undergoes a process which renders it still more offensive; for the mill-owners below the flood-gates having a deficiency of water, contract with the proprietors of the Canal for a supply of water for their boilers. The water is conveyed for this purpose in pipes to the boilers, and after being used for the generation of steam, is conveyed back again into the Canal, so that the waters of the Canal are scarcely ever cool in summer, and constantly emit the most offensive gases. The public health suffers considerably in consequence in the neighbourhood of the Canal, as it appears from the mortuary returns that more deaths have occurred in this locality than what have occurred in a better conditioned locality. During the last summer the surveyors began to lay down an efficient drain in the principal street (Kirkgate) in the place of the old drain, which was too small for the purpose for which it was intended; and in order to promote the health of the town it was thought expedient to empty the drain into the Beck below the flood-gates. This plan, however, they were for some time prevented from carrying into effect by the Canal Company, on the plea that it was a *diversion of the water to which they were entitled.* The Company ultimately allowed the original plan to be carried out, either because they thought the powers given in their Act were not sufficient to prevent it, or because a consideration for the public health triumphed over private interests. The surveyors think that not only should the flood-gates be removed from the populous neighbourhood where they are, but that they should have the power to empty the drains into whatever part of the Beck they may think best, provided no better receptacle can be found for the

filth. They are also of opinion that some general system of efficient drainage should be adopted throughout the whole town.

The Bradford Beck passes through the most populous parts of the town. The stream, as stated above, is the receptacle for the filth of the town, and during the dry season of the year emits very offensive smells. It is liable to swells in rainy weather, and the lower part of the town is inundated. These inundations of late years have become more frequent in consequence of the encroachments made by building either in or over the watercourse, which prevent the ready flow of the water. The owners of the property on either side measure and sell half the bed of the stream, and the purchaser, as a matter of course, thinks he has a right to appropriate this as he thinks fit. During last summer the surveyors were desirous of removing a deposit which had accumulated under one of the bridges, the removal of which would assist the escape of the water and greatly tend to prevent a recurrence of floods; but they were advised that they had no power to interfere in any part of the stream. They are of opinion that they ought to have power to prevent any further encroachments in the bed of the Beck, and also to have power to lower all or any part of the bed, and to flag or pave it if they think proper, so that the water, in times of flood, may escape the more rapidly. It ought to be stated that the registrars after a flood notice an increase of deaths from epidemic disorders in those parts of the town which have been flooded.

Several nuisances exist in different parts of the town; but as they are private property, the surveyors have no powers to interfere to cause their removal. One of these is in the most public part of the town, and in the very centre of business, and consists of refuse, offal, &c., from the butchers' shops, necessaries, ash-places, and urinaries. A part of this locality is unpaved, and in wet weather is nearly ankle deep in mud. This is private property, and therefore the surveyors understand that they cannot cause the removal of these nuisances. There are nuisances of a somewhat similar description in Stoll Hill, near the parish church and the Catholic chapel. The surveyors think that either they or some other public body ought to have power to remove these and similar nuisances in the town.

The factories are numerous in Bradford, and an immense quantity of coal is consumed in their furnaces. The coal consumed is of the worst kind, and contains a great proportion of sulphur. The atmosphere of Bradford and its neighbourhood is constantly impregnated with the smoke arising from these furnaces, and is highly prejudicial to the health of those who inhale it. A clause was inserted in the Local Act, the object of which was to compel the mill-owners to consume their smoke by the erection of apparatus for that purpose. This clause has, however, been found to be inoperative from the loose way in which it is worded. The surveyors think *that* in any Act which may be obtained for the better regulation of Bradford, a clause clearly defined ought to be inserted, making it imperative on the mill-owners to consume the smoke of the furnaces.

The surveyors are of opinion that in the formation of new streets the owners of the ground thrown out for building should be compelled to set out the street open at both ends, and that it should be paved and sewered to the satisfaction of some competent surveyor before

any erections are made thereon, and that no new erections should be allowed, unless they have cross drains from them to the main drain. From a want of a provision of this kind the streets in Bradford are built in a most confined manner, and they are unpaved and without drains.

By order of the Board of Surveyors,

(Signed) W. Clough, Clerk.

SHEFFIELD.

Report by Mr. Lee, Inspector of Highways.

Sheffield, Highway Offices, November 28, 1843.

In a report of the inconveniences and expense entailed by management of roads in Sheffield, without system, and under different surveyors, I may refer generally to Dr. Holland's "Vital Statistics of Sheffield," recently published. A few facts, not contained in that work, may be briefly mentioned. One great inconvenience and expense was the expenditure of large sums in the neighbourhoods of the several surveyors, while the principal thoroughfares were comparatively neglected; but the root of this and other evils was the absence of an efficient, independent, permanent, paid officer. My predecessor, who was employed many years, *could neither read nor write.* He kept horses and carts which, under his own superintendence, performed team-work, by the day. He recommended and overlooked the making of common sewers, and at the same time contracted to do the work himself without level, plan, specification, or written agreement, and of course without any regard to the dimensions required in the localities. Within the last eight years, several miles of such sewers have required to be entirely reconstructed, and some are now in the state indicated in the sheet of transverse sections of the older sewers, in Bowling-green-street and Norfolk-street.

Jobbing to a great extent was done with persons who supplied materials and labour; and one surveyor had frequently a large piece of work executed in his own neighbourhood, without even the knowledge of his colleagues, and to complete such work as speedily as possible, any kind of material was used. The form and construction of the street pavements was almost a matter of chance, some carriage-ways having twice the proper convexity, and others being so flat as not to clear themselves of water. The surveyors annually elected accepted the office, ignorant of their proper duties, and when they began to see the evils that existed, and were competent to apply a remedy, their time of office expired, and they were succeeded by others.

No books of the expense of roads and works were kept, and the annual cost of maintaining a certain length of any kind of road was so little known, that the last surveyors, before the passing of the present Highway Act, rendered the public liable to repair for the consideration of 100*l.*, a line of three roads, which have cost annually, since that time, the average sum of 241*l.* 1*s.* 1*d.* In places where the active management is entirely in the hands of the annually appointed

surveyors, the expenditure is much greater than necessary, and the roads in a very inferior condition, and the most improper and illegal practices exist. At the annual passing of accounts, in March, two years since, a surveyor informed me that in his parish statute duty was still performed, and that they had taken no further notice of the present Highway Act than to alter the time of electing surveyors from September to March.

Since the present inquiry was proceeding, I have received a letter from a rate-payer in a neighbouring township, who had read in the public prints the queries put to me by the Commissioner. I communicate it, though anonymous, because it displays the mismanagement inflicted on a populous place, *where there is a Board*, but no responsible permanent surveyor.

SIR, Township of ————

I take the opportunity of addressing a few lines to you, respecting the management of the Board of Highways for ————. It has been the custom for a number of years for men to get into office, to serve their own interests rather than that of the town at large, by expending money where it is not wanted, for the sake of improving their own property, while at the same time a number of other places have altogether been neglected for the want of a proper person to bring those places before the Board.

Proposed improvements have been disapproved of altogether by the present Board, on account of the expense, saying that they wanted to do with one book, while the next that comes into office will be obliged to have from two to three books, to repair certain roads that these parties have neglected, and yet these very gentlemen can always oblige their friends and neighbours with what they may want, by one surveyor saying to another, "you must survey my job, and I will survey yours." By these means they put it out of the assistant surveyor's hands having anything whatever to do with work. One gentleman has brought forward certain streets that want both common sewers and repitching; but because he could not get a majority for it, nothing could be done, where nuisances have been complained of for years, to my knowledge. He has, in consequence of this, refused to act with them any more. Such is the practice and economy of the ———— Board of Highways. Much more might be said, to show that there is a great deal of partiality where there ought to be none.

I remain, &c.,

To Mr. W. Lee. A RATEPAYER IN THE ABOVE TOWNSHIP.

The improvements that have been effected in the township of Sheffield, by a more comprehensive system, may be briefly stated:—

I. The reconstruction of several miles of the older sewers.

II. The extension of paved carriage ways; so that from the 25th March, 1836, to the 25th March, 1843, the macadamized roads have been reduced from 52 in number, extending $11\frac{1}{4}$ miles to 35 extending 7 miles.

III. The generally improved condition of all the public highways in the township; and,

IV. The constantly decreasing annual expenditure, even while such improvements were being effected, the amounts for the last eight years being as follows:—

	£.	s.	d.
1834—5 . . .	9,237	1	2
1836—7 . . .	8,913	9	6½
1837—8 . . .	8,032	5	0½
1838—9 . . .	8,561	15	3½
1839–40 . . .	8,252	4	2
1840—1 . . .	7,906	1	0½
1841—2 . . .	7,534	7	7
1842—3 . . .	7,234	16	11½

There are in reality no legal powers in force to regulate the drainage of towns like Sheffield, and the general Highway Act contains many defects that would be easily pointed out. It is indisputable, that the highway funds are extensively wasted and mismanaged, and that the majority of parishes are too poor singly to pay the salary of an efficient surveyor.

I think, therefore, that the formation of districts should be compulsory, and that such districts should be sufficiently large to secure the whole services of an efficient permanent surveyor, who should possess the qualifications of a civil engineer. Such districts might be identical with the Poor Law Unions, or, what would be better for drainage, might comprise geological areas, containing a large population, without regard to the arbitrary boundary lines of counties and parishes. I have no hesitation in saying, that on the grounds of economy and efficiency, the sewers and the roads ought to be under the management of the same surveyor. That which is best for a part will be good for the whole, and therefore, any improved legislative enactments should secure not only scientific management, but as far as possible UNIFORMITY. If it be objected that an extensive system of artificial drainage would only be required for populous districts, a separate Act might be passed for the paving, cleansing, and draining of city and town districts, and another providing for scientific management of the roads in rural districts.

The spirit of the two Acts would be the same,—the difference only in the practical detail of each.

The qualifications for the office of commissioner, or member of a Board, should be such as to exclude all *jobbing cabals*, and attempts to serve private interests at the expense of the public; and to secure the greatest amount of intelligence and respectability.

The qualification of surveyor should be his scientific attainments, skill, and experience, and an unblemished character. A person should not be a more eligible candidate for the office because he has many friends, but has been unfortunate in some other business.

The respective duties of the Commissioners or Board, and the surveyor of the district should be clearly defined, and no Acts of the former should have any force or virtue, but those of the major part of the members present at a meeting of the body duly convened.

To induce men of talent and integrity to accept the situation of surveyor, the office should be held permanently during good behaviour, such an officer so qualified and faithfully discharging his duty ought to be protected from the unpleasantness of an annual re-election by the Commissioners or Board, when his salary may be reduced, or even his

situation be placed in jeopardy, because in the exercise of his public duties he may have rendered himself obnoxious to individuals who have since contrived to get themselves and their friends into office for the purpose of injuring him. The more efficient and talented the officer, the more easily such designs against him succeed, because the rate-payers, satisfied with the previous management (and for the continuance of it, the known character of the officer is a guarantee), become apathetic and indifferent to the election of the Board, and leave its construction to those who have some sinister object to attain. I have dwelt more at length upon the qualifications and duties of the various officers, because it is of little consequence what may be the law, unless it provide that they in whose hands its execution may be placed shall be properly qualified.

Estimates.

For private house drainage, I have no doubt tile-piping would be the best, but I cannot state the exact expense, because they have not been used in Sheffield:—efficient house drainage, whether by tile-pipe, brick, or stone, 4*s.* 6*d.* to 6*s.* per running yard.

Where water-closets are used, the whole of the soil and liquid refuse passes into the sewers through the leaden pipe and a small drain. The charge of the water company, I believe, is 30*s.* per annum for each closet, they might probably be supplied for much less. After the first outlay a *good* water closet will not cost in repairs perhaps more than 5*s.* in eight or ten years; but the ashes or dust would still require moving, and as it is not used here for making bricks, the expense would be per house 5*s.* to 10*s.* annually.

The *cheapest* mode of house cleansing, irrespective of all other considerations, is undoubtedly the present one, (i. e.) privies with ashpits, and cesspools emptied, perhaps, twice or thrice during the year by farmers in the neighbourhood, who pay the occupiers of the houses from 1*s.* to 3*s.* per cart-load.

The cheapest form of closet used here is called the "servants' closet;" it is merely a bason or pot inserted into a pipe or drain, with a tap from the cistern to wash it out occasionally. *It is by no means efficient.* The cost would vary, being greater if fixed upon the first or second floor than upon the ground; much would also depend upon the distance from the sewer. The general average would be:—

	£.	*s.*	*d.*	£.	*s.*	*d.*
Plumber . .	4	0	0			
Joiner . . .	2	0	0			
Mason and drain	2	0	0			
				8	0	0

The best and most effective water-closets used here are the various kinds of "pan-closet," but they require the handle to be lifted up every time they are used; and the various "self-acting closets;" either of these kinds would cost under similar circumstances to the above 12 0 0

N.B.—All closets inferior to the two latter are liable to become filthy and disgusting.

It is somewhat difficult to say what number would be required; but if every house in the densely populated part of the town were to have a separate water-closet, there would be at least 18,000

If the houses in each court had the present privies turned into a common water-closet, with a large cistern over it, the number would probably not exceed 8,000

In the densely populated part of the borough there are probably 40 miles of streets, containing an average of 450 houses per mile; this would give the 18,000 houses stated above; 10 miles may be deducted for sewers already made, leaving 30 miles of new sewers to be constructed, which, at 880*l.* per mile, would cost 26,400*l.* or 27,000*l.*; the average charge per dwelling-house, for main sewers, would therefore be 1*l.* 10*s.*, and the annual instalment for repayment in 30 years of principal and commuted interest, at 5 per cent., would be 1*s.* 9¾*d.* The charges would therefore be as follows:—

First Outlay, per Tenement.		Annual Instalment of Principal and Interest for 30 Years.	
Servants' Closet:—	£. s. d.	s. d.	
Water Closet, Cistern, Drain	8 0 0	9 6½	
Main Sewer	1 10 0	1 9¾	
Water	..	..	unknown.
	9 10 0	..	
Pan, or Self-acting Closet:—	£. s. d.	s. d.	
Water Closet, Cistern, Drain	12 0 0	14 3	
Main Sewer	1 10 0	1 9¾	
Water	..	..	unknown.
	13 10 0	..	

I have prepared a sheet exhibiting transverse sections of some of the *older sewers*. Several of them are capacious,—none of them are in the best form; some that were laid down only a short time before my appointment are in a ruinous condition, and in any efficient system of drainage, would require to be reconstructed in a better form, and at a lower level.

The cost of bricks for sewers varies according to the size, quality, and other circumstances, for every 1000, from 18*s.* to 24*s.*

The cost of making the same, for every 1000, from 13*s.* to 17*s.*

I have also prepared a sheet of transverse sections of the sewers constructed during the last eight years. Nos. 4, 5, and 6, are not good for cleaning themselves; they are very seldom used, never but when the inclination of the street is great, and then only because they are very cheap. Nos. 7 and 8 are the general forms of grate-soughs or gully-holes; the cost per running foot for each is as follows:—

	s.	d.	s.	d.
No. 1 . .	5	4		
No. 2 . .	4	0 to	4	3
No. 3 . .	3	4 to	3	9
No. 4 . .	2	6		
No. 5 . .	2	2		
No. 6 . .	1	10		
No. 7 . .	1	4		
No. 8 . .	1	0		

The private house drains are generally badly constructed, and as I have in a previous communication informed the Commission, cost from 8*d.* to 1*s.* 9*d.* per foot; the forms of several are given upon the sheets of transverse sections of the older sewers. Owners of property are frequently much imposed upon in price. They might have drains better constructed for the cost of labour and the material only, by our men, *but they prefer making their own bargains.* Applications are seldom made to me respecting drains by the owners of property, excepting to determine disputes between the contractors and themselves, or when the drains are found to be useless.

There is no charge for entrance to public sewers: great injury having been long done to the sewers, and to the street pavements, by unauthorized persons disturbing them. A printed notice has been recently posted in the town; and by the direction of the Board, I have prepared a printed form of permission, a copy of which is attached to that notice.

There are no other public regulations for private drainage.

I have prepared a sheet of transverse sections of the best forms and sizes of drains, and have shown in colours the materials available in the locality. I have no experience to enable me to say whether or not tile-piping for small drains would be cheaper than any other material. *I think it would;* but the public drains could not be well executed, *upon a large scale*, cheaper than at present. The prices per foot lineal would be about as follows :—

	s.	d.		s.	d.
No. 1 . . .	6	6	No. 7 . . .	1	8
No. 2 . . .	4	8	No. 8 . . .	1	8
No. 3 . . .	4	0	No. 9 probably	1	6
No. 4 . . .	3	6	No. 10 . . .	1	6
No. 5 . . .	3	0	No. 11 . . .	1	6
No. 6 . . .	2	8	No. 12 . . .	1	6

Nos. 7 and 8 are intended for grate-soughs, and Nos. 9, 10, 11, and 12, for courts, houses, and other private drains.

My jurisdiction is confined to the township of Sheffield. There is a separate Board in Ecclesall Bierlow. I believe there are some few sewers there, *but the officers confess they know nothing about them.* If there are any sewers in the other townships, namely, Bright-side, Bierlow, Attercliff-cum-Durnall, Nether Hallam and Upper Hallam, the respective authorities *do not know it.* I have therefore necessarily confined my plans* for the Commissioners to the township of Sheffield.

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* These plans were transmitted to the Commission, but it was not considered necessary to insert them.

The scale upon which they are laid down, is two chains in an inch. The private streets and lanes were generally in a filthy and abominable state until a few months since, when I induced the Board of Guardians to employ a large number of able-bodied paupers in removing the refuse, *and it has not yet had time to accumulate again.* These roads, and all that are *unpaved*, I have coloured GREEN. The public streets are in good condition; but as one mode of repair is more conducive to cleanliness than another, I have distinguished the *macadamized* streets by colouring them PINK; *the boulder pavements*, YELLOW; and the *square stone pavements*, BROWN. All the foot pavements in the streets are curbed and flagged. The BLUE lines show the lines of equal altitudes; the RED lines and lettering, the situations, sizes, and depths of the sewers. The BLUE *spots* represent water-closets; and as all the remaining houses have only common privies, they are sufficiently distinguished without colour.

I am unable to say that there is any street, through which there is a public sewer, entirely without private house drains.

WILLIAM LEE, Assistant Surveyor.

To the Health of Towns Commission.

PLANS generally adopted in the TOWN of SHEFFIELD for COTTAGE HOUSES.

I APPREHEND that no legislative enactment can be made to compel persons to invest capital in the erection of buildings for the use of either rich or poor, unless such an investment is likely to produce a fair return; it would therefore be wasting time to give designs of cottages for the labouring population, unless it can be shown that such cottages can be let to pay fair interest for the capital invested.

Being unacquainted with the exact plans of cottage property in any town but Sheffield (where, by the way, it is generally admitted the lower classes are better off both as to convenience, extent of accommodation, and rent, than in most other towns), I will briefly describe the plans generally adopted. Cottage houses, or common tenements, as they are commonly termed, are built in rows, back to back, one house fronting a street, another fronting an enclosed yard. Each tenement has a cellar, living or day-room on the ground floor, and chamber or garret for sleeping-rooms.

The cellars are drained by a sough running longitudinally under the floors, from thence into a main sewer, or, if there be none (which is frequently the case), into as small a sough carried along the street until the requisite fall is obtained as the owner can make.

The cellar is almost invariably covered over with a brick-arch floor paved, and has an aperture in the foot-path for light and air secured by a cast-iron grate.

The living or day-room is about nine feet high, floor paved with flags. The fire-place is fitted up with an oven to bake bread, &c., and side boiler with a tap for hot water, dished slop-stone with a lead pipe to carry the waste water into the street channel or sewer, an iron pan to contain 8 or 10 gallons set in brick-work used for brewing, boiling water for washing, &c.; also a cupboard, besides sundry shelves, &c.

The chamber is from 8 feet to 8½ feet high with boarded floor, has a fire-place and stove-grate. The chamber is made private by a ceiling covering the attic stairs.

The garret is about 7 feet high, and is sometimes fitted up with a fire-place, stove-grate, &c. Formerly many of the cottages had casement windows, but those erected within the last 20 years have generally been fitted up with double sliding sashes. The great superiority of sliding sashes over casement windows for the purpose of ventilation is now so well understood and appreciated that any comment thereon would be superfluous.

The cottages before described, containing, as we have seen, a good cellar, living room, and two private bed-rooms, previous to the great depression of trade, let on an average at 2*s.* 6*d.* per week, or 6*l.* 10*s.* per year, the landlord paying poor-rates and water-rent, the tenant paying highway-rates. The cost of erecting such cottages, including fencing the yard, privies, ash-vault, soughing-yard, and street paving, &c., according to the manner or quality of building, from 60*l.* to 75*l.* each

Gross rent paid by the tenant, 6*l.* 10*s.*

Interest on—say 70*l.*	£0	3	10
Ground rent	0	15	0
Poor-rates and water-rent	1	0	0
Repairs, insurance, and loss by empty-houses, and bad rent	0	10	0
	£5	15	0

So that the landlord cannot expect to get more than 6 or 7 per cent. at furthest on his investment, while his capital is being reduced every year by the gradual dilapidation of such perishable property.

These cottages being constructed with fire-places in, and chimney-flues from, every room in one or more of which a fire is constantly burning during the day-time, thereby rarefying more or less the air in all the flues, with proper attention to the opening of the sashes carries on as complete a system of ventilation as I conceive can be effected without the introduction of complicated machinery, which would, if left to the management of tenants, soon fall into disuse. The only improvement I can suggest in the erection of such cottages would be to make the rooms a little larger and loftier.

It has been said that cottage-houses ought not to be built back to back, but should have both front and back doors, in order that a current of air might pass through the house to ventilate it; but it must not be forgotten that the lower as well as the upper classes, the strong as well as the weak, suffer from direct draughts or currents of air; and may it not be as necessary, if not more so, for the thinly clad and poorly fed mechanic and his family as for the upper classes who lack neither clothing nor food. Cottages erected on a plan similar to the accompanying sketches are not only built at less cost, but, in my opinion, much warmer and better ventilated than houses having front and back doors with thorough draughts.

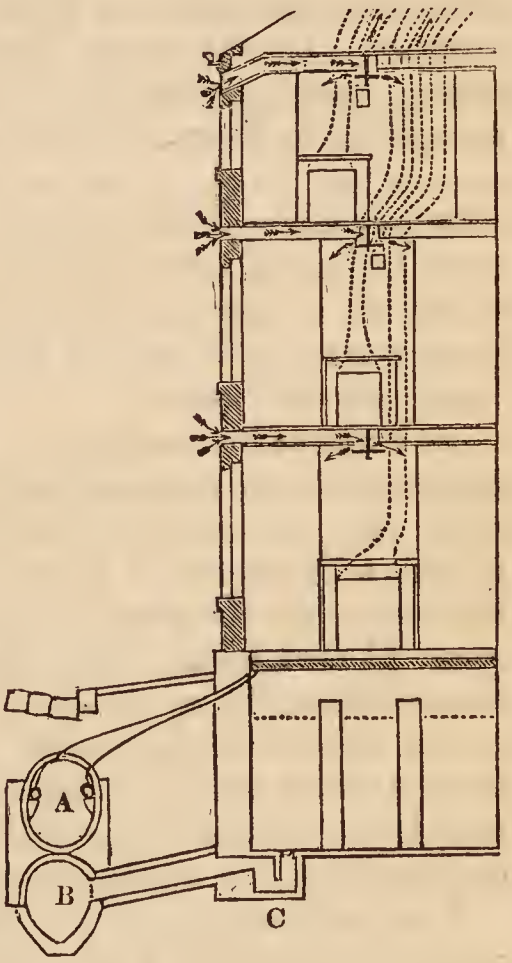
After providing a warm, well ventilated, and well arranged cottage for the artisan and his family, the next consideration is drainage. From the want of proper attention to this first essential to the health of towns

(affecting, as it does, the health of the poor ill-fed much more than the well-fed) have arisen fevers and a long catalogue of diseases affecting the health and lives of the inhabitants. This has been the plague-spot of our towns and villages. Let all the surface-water be conveyed under ground as soon as may be by well-contrived and spacious common sewers, sunk deep enough to drain all cellars, &c. : compel the introduction of well contrived stench-traps, whenever a communication is made from the cellars into the main sewers, and also to all street-grates, and the hydra-headed monster, fever, is more than half subdued. No matter how numerous or capacious the common sewers may be, unless the foul air generated in them be prevented being drawn therefrom into the cellars and drawn thence by the warmth of the upper rooms amongst the inhabitants of the house, the evil is but half remedied.

The next consideration is the least offensive kind of privies or water-closets. I think the ordinary kind of water-closets not only too expensive but totally unfit for the use of the poorer classes. I may venture (after a good deal of experience in such matters) to say that I am pretty certain if two of the best and strongest kinds of closet, with an abundant supply of water, were put down for the exclusive use of eight or ten cottages, they would not only be out of repair in a fortnight, but useless and a positive nuisance ; then what is to be done with children ? they could not be taught to use them properly ; or, suppose they could, who is to keep them out of mischief. In a large and well-regulated hospital for fever patients situate in a sea-port town that I visited some years ago to examine and report on the method of ventilation, &c., I was told that it was next to impossible to keep the water-closets in order in consequence of the mischievous propensities of persons using them : sometimes they thrust old stockings into the trap, at others spoons, and even knives and forks had been found there. If, however, some simple plan could be adopted not easily put out of order, with a plentiful supply of water, and proper officers, such as policemen, appointed to pay periodical inspection visits, with power to order the closets to be cleansed and repaired, if necessary, and conviction before the magistrates to fine persons for neglect or mischief, under such circumstanses, I think the introduction of well-regulated water-closets instead of open privies and soil-vaults would be a great benefit to those who are under the necessity of living near those conveniences.

I have already given an opinion as to the best method of ventilating cottages during the day-time without the introduction of any artificial means; and although great benefit may be derived by proper ventilation during the day, it is of much greater importance in the night, when the small bed-room of the artisan is occupied by himself, his wife, and, may be, one or two children, containing perhaps not more than 1000 cubit feet of air, the fire-place probably boarded up to keep the room warm, and so prevent ventilation that way ; these are the rooms in which the family spend perhaps at least one-third of their lives, not unfrequently breathing the same air over and over again ; it is evident, therefore, that if ventilation is of importance anywhere, if must be especially so in a bed-room. So much depends on the inmates of the house using the means provided for the purpose, that to propose a plan which would be generally applicable seems an exceedingly difficult task ; persons, especially poor persons, like to be warm and comfortable when they go to sleep ;

thinking nothing of the bad effects of breathing over and over again a vitiated atmosphere, they close up every place that may let in air; at this we cannot be surprised, especially if the air comes in draughts. The grand object to be gained is the ingress of fresh air in moderate quantities, not in currents, but contrived that it may spread all over the room so gradually as not to be perceptible to the inmates. I have introduced a plan of supplying the day and bed-rooms of the Ecclesall Bierlow Union poor-house with fresh air which answers the purpose admirably. An opening is made in the outer wall and a flue carried from thence between the floor timbers to the middle of the ceiling, where the air passes into the room; in order to prevent the current of air from rushing downwards, the aperture in the ceiling is masked by a large circular iron plate, on to which the air impinges, and is thrown off in all directions horizontally, gradually mixes with the air in the room, and drives out the foul air. This plate is fixed to a screw passing through its centre; and by turning the plate round, the aperture may be closed or opened little or much, and the supply of air regulated at pleasure. See drawing and section. There is another but less certain method of ventilating bed-rooms, uncertain on two accounts; first, because the living-room fire would not always be burning; and secondly it would be affected by changes in the atmosphere. The plan is as follows: to form small air-flues from the chamber and attics and carry them up by the side of the living-room fire-flue—the air-flues to commence close to the bed-room ceilings and continue up above the roof. The rarefication of the air in these flues caused by the heat of the fire-place, if constantly kept up, would ventilate the bed-rooms; but if a sufficient heat was not maintained, the ventilating process would cease, and cold air would come down the flues into the rooms, and the consequence would be that the apertures would be stopped up and the partial efficiency of the ventilating flue destroyed.



A. Culvert for gas and water-pipes.
B. Common sewer. C. Trap.

I think it most desirable, both on account of their more exclusive usefulness and greater economy to the town, that water and gas-works should, if possible, be the property of the town, and be managed for the benefit of the inhabitants generally, all profit derived therefrom to be used for public purposes.

The Board of Surveyors of the Highways appear to be the proper parties to undertake the management of these works, the attention of the surveyors and their officers being principally directed to engineering pursuits; and besides, as the streets are being continually broken up for laying either gas or water-pipes, and much unnecessary expense incurred thereby, it seems to me that the interest of towns would be best

secured by uniting the water and gas-works with the highway management.

If a regular system of drainage be introduced, connecting water-closets and soil-vaults, and for carrying away the mud, &c., from the streets, how valuable for such a purpose would be the well-directed use of any surplus water, and during the rainy part of the year when water was abundant all the sewers in the town might be scoured out at little or no cost. If the authorities of the town had the control of water and gas, there would be no need to deal both out with such a niggard hand, because, after supplying the inhabitants at fair prices for their own private comsumption, the surplus might be used without scruple for the use of those who pay for it, and who will gain nothing by stocking up or wasting gas or water rather than lower the price.

It would be highly advantageous, both for the public health and economy, if there was some well-considered legislative enactment to enable and perhaps to make it imperative on surveyors of highways to carry out by degrees a general plan of drainage, in both towns and villages. In the town where I reside, till within the last 20 or 30 years, sewerage has been left to the owners of property, who were compelled to drain their cellars, otherwise none would have been made.

It is not in my power to state how much extra cost the owners of property have incurred by every one doing his own work than would have been the case had the whole been done by the town, supposing they had to pay the town for doing the work for them; but I think, from what I have seen, I shall be within compass if I say the cost has been at least threefold.

If I might be permitted to recommend a plan which would in my opinion have a tendency not only to improve the sewerage but economise the expenditure, I would have a common sewer on each side of all the wide streets, if possible just under the channels or curb stones, the bottom of the sewers to be 12 or 14 feet below the roadway, and at least 4½ feet high. Into these drains I should of course turn all the house-drains, being properly trapped above the common sewers. I would have another vaulted passage for the express purpose of fixing therein water and gas mains, so that mains might be laid or repaired, and the inhabitants supplied with water and gas, without obstructing or damaging the carriage-way at any time.

The real meaning of the word economy in the expenditure of public money, as applied to the sanatory condition of towns, especially the wholesome ventilation of house drainage, and the general comfort and convenience of the inhabitants, is little understood. If the wealth of a nation be its population, is there nothing saved to the public by preventing (as far as the adoption of such measures can, and there are many proofs that much, very much, can be done) malignant and other dangerous fevers caused by an accumulation of stagnant water and filth.

The preservation of the public health is not merely an act of humanity, but a substantial saving of public money. The loss of health impoverishes families sometimes to such an extent as to compel an application to the parish for relief; and when the heads of families are taken away, how are the (too frequently) helpless wives and children to be provided for, but out of the public purse? Look at the subject in

any way, and it will be found that the cost consequent on the loss of health and premature death of the working classes falls on the public, either directly by parish relief to the survivors, or indirectly to the contributions of private individuals. If this be so, what is it but an improvident waste of life and money to delay the introduction of those sanatory regulations which will no doubt be so beneficial to the public health?

Nothing would add more to the convenience of the male population of large towns than the introduction of urinals in the streets. I need not dilate on the great injury sustained by many persons in consequence of their inability to find a convenience "where decency does not forbid;" neither need I point out the outrage on female delicacy by the too frequent and in many cases of absolute necessity, of an exposure equally painful to both sexes: it is always best to provide what is necessary fairly and without disguise, making it as decent as possible. Matters of detail requiring constant attention should be superintended by the police, such as inspecting water-closets, or privies of the working classes, common yards, pumps, traps, urinals, &c., with power, if need be, to order them to be cleansed, and, on conviction before a magistrate, fine parties for neglect.

It is worse than useless to legislate upon matters of this description unless Parliament provide means for carrying their Act into effect; no Act of Parliament having for its object the improvement of the health of towns can be carried into operation unless parties are employed to be constantly on the look-out to prevent the provisions of such Act becoming a nullity.

There is a considerable waste of money in almost every branch of the public service, from the apathetic indifference of many persons annually elected to render their gratuitous services as overseers of the poor, guardians, surveyors of highways, &c. It is notorious that the duties of such persons are lamentably neglected and left almost entirely to clerks; truly has it been said "everybody's business is nobody's business," everybody meaning the public, and perhaps nobody the overseers. When anything very flagrant happens—and it must be very flagrant indeed to rouse the public attention—objections are raised against the appointment of individuals to public offices, when it is known that they have attained their situations by some manœuvre to serve their own interests or the interests of some of the paid officers. One thing is clear enough, (excepting in extraordinary occasions,) the clerks select and appoint who they think proper—in fact they choose their own masters either directly or indirectly. Such a state of things ought not to be permitted; for if the selection be as good as could be wished, the officers have an immense advantage, by being in possession of the minutæ and ins and outs of the business, while the overseers, &c. are probably as ignorant as children who have got their first lesson to learn. Since Boards have been more generally introduced, it would appear as though individual information on details had gradually diminished. Each member of the Board probably quiets his conscience by hoping his colleagues, some of whom have more leisure than himself, will pay close attention to business, or at all events the clerks and auditor, if there be one, will take care that all is right; so that while on the one hand Boards have undoubtedly prevented that barefaced

jobbing so prevalent under the old system, on the other hand it is to be feared the members generally act as though their duties extended no further than sitting in council at the Board.

For the salutary regulation of public affairs, Central Boards are indispensable to prevent, as far as possible, the appointment of improper persons to public officers, whether honorary or paid, and mismanagement, jobbery, and peculation. Every town should be divided into districts, and one or more members of the Parochial Board selected therefrom. If the Board immediately after its appointment was divided into a given number of committees, each having its exclusive department particularly defined, and required to present a report of the business in hand periodically to the Board, this division of labour, with the necessity of doing it, would make the task both easy and effective.

The auditors appointed under the New Poor Law are all very well in their way, but they can only detect mischief when it is completed. What is wanted is some method of preventing, or at all events nipping, it in the bud. Auditors see only the surface after everything has been smoothed off ready for them, whereas they ought to see the working of the machinery from the beginning to the end, as well as the result.

Might not one or two respectable and responsible persons, who should occupy their time entirely with public business, be appointed by all the local Boards, with salaries subject to the approbation of the Board of Control, to take upon themselves the general surveillance of all parochial affairs, and audit all accounts, not interfering in the slightest degree with the acts of the different Boards, but to see that their orders are properly carried into effect; to have unlimited power to inspect all books and documents at any time; in short, to see that the officers honestly and diligently discharge their duties themselves, being required to render periodical reports on the sanatory condition and general state of the town, the account and conduct of the officers, &c., to the Central Board.

The Central Board should be composed of gentlemen who have had experience in such business as will come before them. No engineers or professional men should be on the Board, although it would be advantageous to have a consulting engineer. The Central Board should have control over highways, sewerage, water, gas, and the general health and sanatory condition of towns. The business of the Board would not be merely to control, but to collect and store up valuable information on all matters connected with their office, and distribute such information, after its merits have been tested, for the use and advantage of the whole kingdom.

The Commissioners should abstain from making any local appointment, leaving such appointments to the local Boards, merely reserving to themselves the right of inquiry into the competency of the parties appointed, and if proved incompetent, to direct the election of a more suitable person. There should be some test of the qualifications of paid local surveyors before their appointments are confirmed; but great care should be taken that the test is as simple as possible, so as not to prevent persons who have not been regularly educated for the office from being elected, because it frequently happens that such persons being practically self-taught are more efficient than theoretical book students. I should like to hear of a plan for rewarding meritorious

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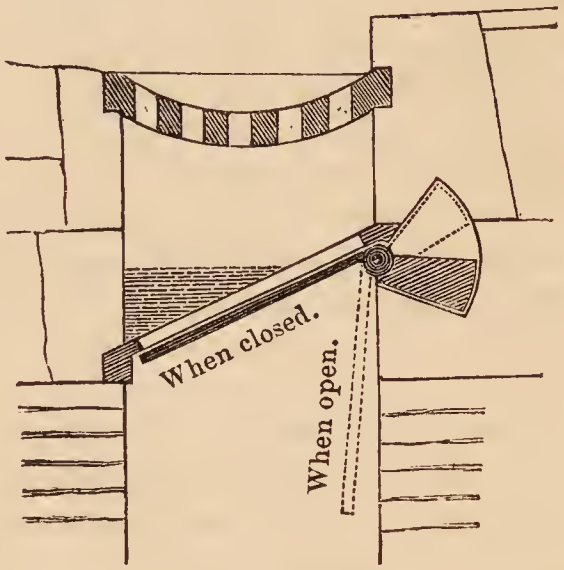
Much benefit and great saving would accrue to towns if the Central Board were to order a general plan to be laid down of each town, showing the common sewers already made, and the best plan of carrying out, from time to time, a complete system of drainage. When such plans have been approved by the local and Central Boards, no alterations should be allowed, unless satisfactory reasons can be assigned, and the approval of the Commissioners obtained.

The plan I propose for trapping the sewers, grates, &c., consists of an iron frame fixed in a sloping position, an iron or wooden door to be hung thereto, having a weight beyond the hinge or centre sufficiently heavy to keep the door close with the weight of a small quantity of mud or water upon it; when an additional quantity was thrown in, the trap-door would sink and let the water and mud into the common sewer—see Plan . The advantage of this plan is its simplicity, and self-acting, and self-cleaning principle. When there was no surface-water passing into the sewer, the trap would of course always be closed.



Trap for Street Grates.

(Signed) William Flockton, Architect.

Sheffield, April 17th, 1844.

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For Her Majesty's Stationery Office.

any way, and it will be found that the cost consequent on the loss of health and premature death of the working classes falls on the public, either directly by parish relief to the survivors, or indirectly to the contributions of private individuals. If this be so, what is it but an improvident waste of life and money to delay the introduction of those sanatory regulations which will no doubt be so beneficial to the public health?

Nothing would add more to the convenience of the male population of large towns than the introduction of urinals in the streets. I need not dilate on the great injury sustained by many persons in consequence of their inability to find a convenience "where decency does not forbid;" neither need I point out the outrage on female delicacy by the too frequent and in many cases of absolute necessity, of an exposure equally painful to both sexes: it is always best to provide what is necessary fairly and without disguise, making it as decent as possible. Matters of detail requiring constant attention should be superintended by the police, such as inspecting water-closets, or privies of the working classes, common yards, pumps, traps, urinals, &c., with power, if need be, to order them to be cleansed, and, on conviction before a magistrate, fine parties for neglect.

It is worse than useless to legislate upon matters of this description unless Parliament provide means for carrying their Act into effect; no Act of Parliament having for its object the improvement of the health of towns can be carried into operation unless parties are employed to be constantly on the look-out to prevent the provisions of such Act becoming a nullity.

There is a considerable waste of money in almost every branch of the public service, from the apathetic indifference of many persons annually elected to render their gratuitous services as overseers of the poor, guardians, surveyors of highways, &c. It is notorious that the duties of such persons are lamentably neglected and left almost entirely to clerks; truly has it been said "everybody's business is nobody's business," everybody meaning the public, and perhaps nobody the overseers. When anything very flagrant happens—and it must be very flagrant indeed to rouse the public attention—objections are raised against the appointment of individuals to public offices, when it is known that they have attained their situations by some manœuvre to serve their own interests or the interests of some of the paid officers. One thing is clear enough, (excepting in extraordinary occasions,) the clerks select and appoint who they think proper—in fact they choose their own masters either directly or indirectly. Such a state of things ought not to be permitted; for if the selection be as good as could be wished, the officers have an immense advantage, by being in possession of the minutæ and ins and outs of the business, while the overseers, &c. are probably as ignorant as children who have got their first lesson to learn. Since Boards have been more generally introduced, it would appear as though individual information on details had gradually diminished. Each member of the Board probably quiets his conscience by hoping his colleagues, some of whom have more leisure than himself, will pay close attention to business, or at all events the clerks and auditor, if there be one, will take care that all is right; so that while on the one hand Boards have undoubtedly prevented that barefaced

jobbing so prevalent under the old system, on the other hand it is to be feared the members generally act as though their duties extended no further than sitting in council at the Board.

For the salutary regulation of public affairs, Central Boards are indispensable to prevent, as far as possible, the appointment of improper persons to public officers, whether honorary or paid, and mismanagement, jobbery, and peculation. Every town should be divided into districts, and one or more members of the Parochial Board selected therefrom. If the Board immediately after its appointment was divided into a given number of committees, each having its exclusive department particularly defined, and required to present a report of the business in hand periodically to the Board, this division of labour, with the necessity of doing it, would make the task both easy and effective.

The auditors appointed under the New Poor Law are all very well in their way, but they can only detect mischief when it is completed. What is wanted is some method of preventing, or at all events nipping, it in the bud. Auditors see only the surface after everything has been smoothed off ready for them, whereas they ought to see the working of the machinery from the beginning to the end, as well as the result.

Might not one or two respectable and responsible persons, who should occupy their time entirely with public business, be appointed by all the local Boards, with salaries subject to the approbation of the Board of Control, to take upon themselves the general surveillance of all parochial affairs, and audit all accounts, not interfering in the slightest degree with the acts of the different Boards, but to see that their orders are properly carried into effect; to have unlimited power to inspect all books and documents at any time; in short, to see that the officers honestly and diligently discharge their duties themselves, being required to render periodical reports on the sanatory condition and general state of the town, the account and conduct of the officers, &c., to the Central Board.

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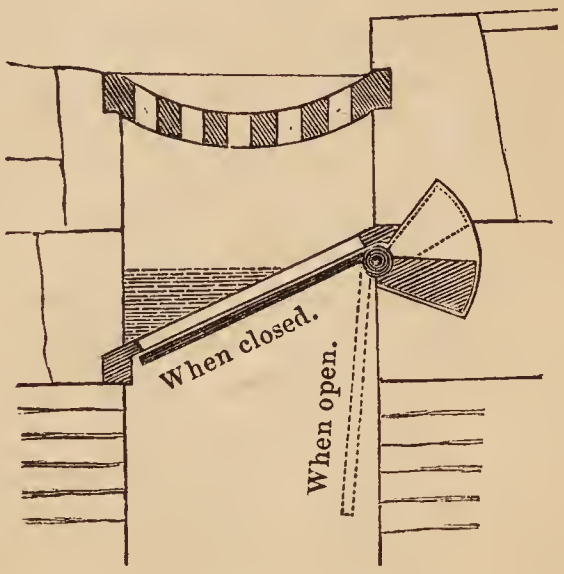

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